THE Johns Hopkins MAGAZINE

June 1950

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THE Johns Hopkins MAGAZINE

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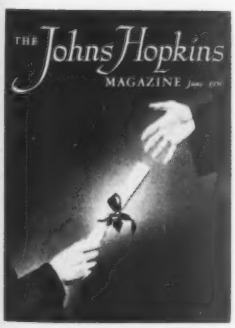

The Cover

The scene on this month's cover will occur more times this June, probably, than ever before in the history of American colleges and universities. On page 15, one member of the record-breaking Class of 1950 speaks his piece.

Photo by Blakeslee-Lane

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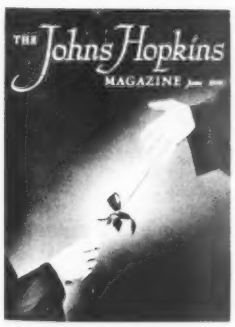

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WHAT ABOUT FEDRA

They are unnecessary, argues this distinguished American educator.

By GUY E. SNAVELY

NEVER HAS THERE BEEN a "royal road to learning." Nor will there be even if every young man or woman is given a Federal scholarship for a chance at a collegiate education. There will still be required hard work and persistent application to study.

This is not the place to belabor the Shakespearean dictum "Sweet are the uses of adversity," but a youth of ability and ambition can usually find ways and means to complete a college education even if he has sizable financial handicaps. Many have done so in the past and many are still doing so.

When the writer completed his elementary school education with the seventh grade, which was the final year throughout the South at the turn of the century, the high school nearest the family farm was some fifteen miles away. It was just too far to travel daily with the horse and buggy.

With wheat selling at sixty cents a bushel and corn at forty cents (they now bring three dollars and two dollars per bushel, respectively) the family exchequer just could not be stretched to permit boarding at the site of the county high school. If *pater familias* had not doggedly registered as a Republican the state senator, always of the other party in Baltimore county, might have saved the day with a scholarship appointment to the Maryland State Normal School.

Towards the close of the summer the new Methodist minis-

Continued on Page 27

DR. SNAVELY, '01, '08, is executive director of the Association of American Colleges and has had a long and distinguished career in American education.

Here are two points of view in a controversy which takes on added significance this spring as the G.I. Bill enrolment passes its peak at most U. S. universities.

DRAL SCHOLARSHIPS?

We need them, says a veteran who went to school under the G.I. Bill.

By WILSON ROBERTS

WHEN WORLD WAR II ended, millions of American young men and women were presented with an opportunity which had never before existed in this country: if they possessed the necessary intellectual talents, they could go to college or graduate school, even if their fathers were poor and their family pocketbooks too small to pay the price. The Federal government, through its "G.I. Bill of Rights," had provided a scholarship system for them.

Until that time, a college education (and there are the usual exceptions to this, of course) had been something in which, for the most part, only the sons and daughters of well-to-do men could indulge. Going to college had long been an expensive undertaking; counting tuition and living expenses, the annual cost at most private universities could not be touched with a thousand-dollar bill. A bright young high-school graduate, possessing far-above-average intellectual equipment, usually found that unless Pop could scrape together a substantial sum of money for four or more years running, his formal education ended with his high-school commencement. The price, obviously, was (and is) too stiff for most American families to pay.

During the war the United States Congress, seeking ways in which to smooth the postwar readjustment of young people whose lives had been disrupted by a call to arms, developed

Continued on Page 29

MR. ROBERTS is a veteran who attended graduate school under the GI Bill of Rights.

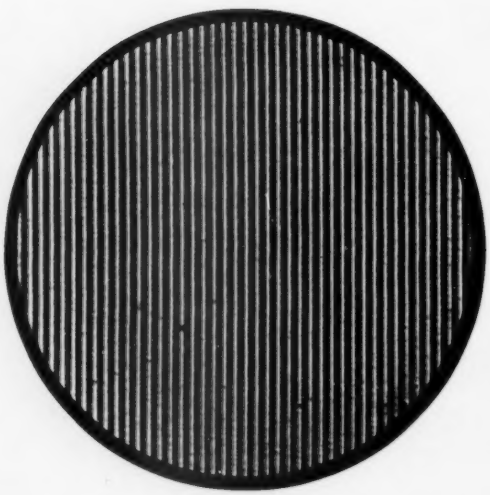
The Johns Hopkins Magazine **presents on these pages two views of an important subject on which the American people may soon be asked, through their representatives, to reach a decision: a Federally-financed program of scholarships in the country's colleges and universities. The opinions expressed in these articles are those of the writers alone, and neither article should be construed as representing a policy of the Johns Hopkins University or the magazine.**

The Editors

Weber, J H U Illustration.

Doctors, steel plants, and atomic physicists all rely on this small glass plate. A new precision machine may further advance scientific knowledge through better

DIFFRACTION GRATINGS



Spurbeck, J H U Illustrations

GRATING SECTION ENLARGED 1000 TIMES. At a rate of 15,000 lines per inch (only half as fine as a grating *can* be ruled), 42 grooves appear here in a section which is actually no bigger than a pin point.

THE STUDY of the spectrum of light is an old science, as old as man's first realization that the seven colors of the rainbow are simply "white" sunlight, refracted to show its component parts. Spectroscopy is used in hundreds of fields: the steel manufacturer employs it to test molten alloy; the police laboratory identifies a hit-and-run car by studying the spectrum of a paint speck. With the aid of spectroscopes, the physicist has charted the structure of the atom and the astronomer has learned the atmosphere on Mars.

Now there is a device which promises to give much greater precision and scope to the science of spectroscopy than ever before. The device is a new machine for making gratings, one of the essential parts of the spectroscope.

First developed at Hopkins seventy years ago, the grating is a glass instrument, typically of about the same size and general appearance

as a shaving mirror. Thousands of parallel and exactly equidistant lines across its surface serve to divide light into more than one hundred thousand colors. The eye is not capable of distinguishing between most of these colors, but the grating differentiates them by revealing their slight variance in wavelength. These small differences are enough to illuminate the makeup of billions of objects in the universe.

There is the very practical application of gratings in the police laboratory, for example. In the case of a hit-and-run driver, a bit of paint (it may be no larger than a speck of dust) is taken from the victim's clothes and put in a spectroscope. When the paint is electrically charged, it throws off a light which is divided by the instrument into its spectral parts. By analyzing the spectrum, the laboratory determines the complete makeup of the paint, the proportions of its basic parts as well as of its impurities. Information furnished by the automobile manufacturers will reveal that that batch of paint was used on one model of one car in a particular year. From that point on it is often a relatively simple bit of detective work to find which car answering that description has a bent fender or a stain of the victim's blood.

SPECTROSCOPY is a highly detailed scientific method which is credited with more vital discoveries in physics than any other technique. Any light source can be studied with a spectroscope. An astronomer may be examining a new star to learn its composition. He will pass the light from the star into a spectroscope. This light divides into thousands of tiny lines, each quite distinct. The astronomer then studies the spectrum to see exactly where the lines fall. Their placement is identified by numbers, signifying their wavelengths. For example, if the spectrum shows a line at the position of 3248 angstroms, the astronomer looks on his chart, finds that 3248 is the wavelength of copper, and knows for certain that the star contains copper, in an amount determined by the strength of that individual line.

These positions, which physicists have identified by experiment, are as definite an identification as a social security number. An object showing line 3248 always contains copper, whether the light is coming from a star or a batch of paint or an apple. Many of the lines still wait to be identified; many more which were once unknown have been explained by research. Scientists found the helium line in the sun, for example, before they even knew what helium was.

The spectroscope is not a new device, but new things are happening to it at Hopkins. The first spectroscope employed prisms to divide the light, using the same principle as the rainbow. In 1880 Henry Rowland, the Hopkins physicist, made the first successful grating, a new kind of instrument for diffracting light.

THE ROWLAND-TYPE ruling machine has been used for the last seventy years at Hopkins to turn out gratings of a delicacy up to 30,000 lines per inch. That is so precise that twenty-five lines, three inches long, are ruled on a section of glass no wider than the thickness of a cigarette paper. For many years Dr. Robert W. Wood, Hopkins professor of physics, supervised the production of gratings and used them to lead physical research into many new fields. A few imitations of the machine have been built elsewhere, but none of them has been considered as good as the Rowland model, and the vast majority of gratings used in the world have been manufactured at Hopkins.

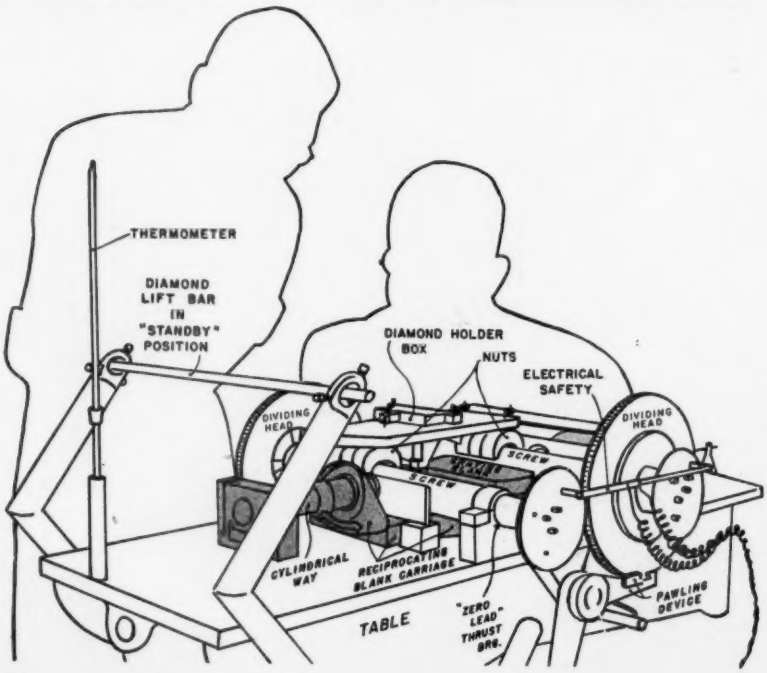
Then, this March, John D. Strong, professor of physics, finished a completely new cutting machine. With a wholly different engineering design, the Strong model is an important advance over Rowland's work. This machine is not only more accurate but much faster than the older type. Before, it took six days to put ninety thousand lines on a piece of glass six

Continued on Page 7

GIANT MT. PALOMAR TELESCOPE USES GRATINGS TO PROBE UNIVERSE.
Ralph Crane from Black Star

Weber, J H U Illustrations

GRATING-MAKING MACHINE INSPECTED BY WILBUR PERRY, CHIEF TECHNICIAN, AND JOHN STRONG, INVENTOR



HOW GRATING MACHINE WORKS

A reciprocating carriage (gray area in sketch) supports a glass blank, moving it back and forth in a single plane, the length of the grooves being ruled.

The diamond which cuts the grooves is suspended from a plate attached to nuts on long twin screws.

When the blank is in position, the lift bar (shown at left in standby position) raises, and the diamond drops against the glass. While the diamond remains stationary, the carriage mechanism moves the blank. When a full groove has been ruled, the lift bar moves to raise the diamond off the surface of the glass. The carriage returns the blank to its starting position. And the screws are simultaneously turned one degree of a circle, thus moving the diamond into line for the next complete ruling motion.

Drawing by William Koenig

inches long. Now it takes only three days.

SO ACCURATE must the rulings be that days of work are required just to prepare the glass blanks. A concave mirror-type grating goes through many processes before it is ruled. The first work is to cut a disk, usually one inch thick and six inches in diameter, from large sheets of thoroughly annealed heavy plate glass.

This blank disk must then be cut to an even concave surface. Diamonds and cast-iron tools are smoothed by the laboratory to make them so accurate that the disk can be cut to a perfect concave with a tolerance "error" of only eight one-hundred-thousandths of an inch. On work so fine, light must be used to determine the accuracy, for there are no mechanical methods delicate enough to detect flaws at such a rate.

After the shaping, the disk goes on a polishing device, where it is rubbed twenty hours with fine rouge to get rid of any small roughness. When the disk is judged as nearly perfect as possible, its edges are trimmed to the shape desired, usually a rectangle. Finally the concave surface is coated in a vacuum with a layer of aluminum about one ten-thousandths of an inch thick. It is this aluminum film which will be ruled to make the mirror act as a diffraction grating.

Then the blank goes to the ruling vault. The ruling machine itself is in a square boxlike structure, about the size of a large clothes closet. The vault is composed of two aluminum boxes, one inside the other, with a space between where the air is kept at eighty-two degrees. The temperature around the ruling machine must be kept absolutely constant, for as small a change as one one-thousandth of a degree will disturb the accuracy of the ruling.

The blank goes on a plate which moves back and forth in a single plane, the length of the lines to be cut. Above it is a mounting holding a tiny diamond which will press the grooves into the aluminum. One mechanism lifts and lowers the diamond on the grating, a separate twin-screw device moves the diamond across the grating at the proper distance for each line. On these screws and their guiding cog-wheels depends the accuracy of the grating: the cogs and the long spiral must be perfect in order to make the lines exactly equidistant across the whole grating. The slightest deviation will cause ruinous distortions. The difficulty of this task may be judged from the fact that an average grating, two and a half inches wide and five inches long, has *three miles* of lines ruled on it. The cutting diamond is good for only about five gratings before it must be resharpened.

The gratings are sold all over the world, to universities and laboratories, to industries and weather stations. One of the large industrial uses is in the making of steel. Each mixture of molten steel must be tested to be sure that it contains exactly the right combination of metals. The old method was to take a portion of the steel and subject it to many different chemical tests—one to judge the iron content, one for nickel, and so on. Since steel must be cast at a certain critical point, this lengthy process risked delaying the casting until the quality of the steel was impaired.

Now the big chemical laboratories next to the steel vats are being deserted and replaced by a few spectroscopes. A small sample of liquid steel is dipped out of the furnace. This is quickly solidified and formed into two electrodes. An electric discharge is set up between them, the brilliant light from the metal vapor of the arc is refracted

Dr. Robert W. Wood was a pioneer in the development of the diffraction grating.

Harris & Ewing

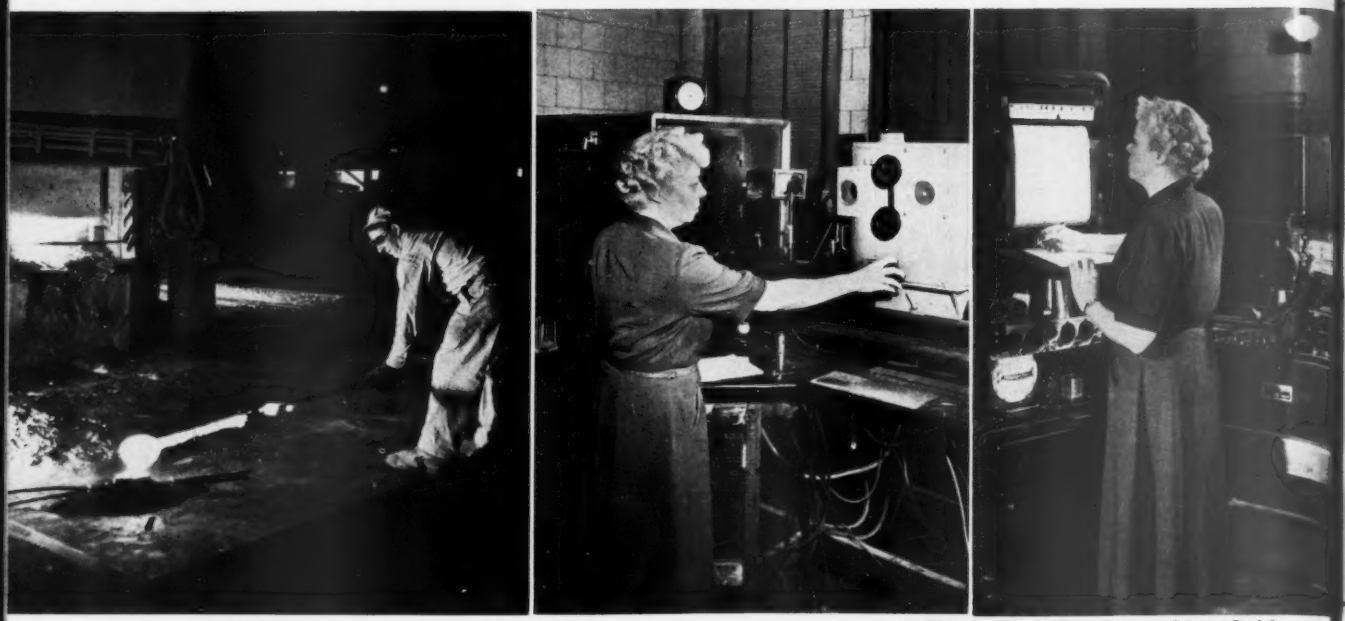
Dr. Robert W. Wood, the eminent Hopkins professor of physics, supervised the production of gratings for twenty-five years, during which time he employed them in his own research and provided others with the instruments which have greatly expanded physical knowledge.

He is considered by many the pioneer in the use of gratings, now recognized as the single most important instrument of the physicist. Dr. Wood used them for early infra-red and ultra-violet photography, to learn more of the constitution of the universe, and in many of his investigations into the properties of light. They figured also in some of his less conventional experiments, such as detective work in several bomb murders.

An ingenious technician, Dr. Wood experimented with the ruling diamond, shaping it to improve the focus of the grating and the clarity of the images. The unusual brightness which he was able to achieve was responsible for many discoveries in the solar spectrum. Further, he perfected a technique for producing replicas of gratings, a doubly useful process which increased the limited supply of instruments and also made possible mosaics of gratings, much larger than any which could be ruled.

Probably his best-known contributions in this field are the gratings which he prepared for the Mt. Wilson and Mt. Palomar telescopes in California. It took Dr. Wood nearly two years to complete four large replica gratings for Palomar, but their value was soon clear: when the first one was installed for a simple preliminary test, it promptly revealed a new star in the heavens.

A sensational improvement over any previous method of reading the spectrum, Dr. Wood's gratings received particular praise from astrophysicists. Thirteen years ago the director of the Mt. Wilson Observatory wrote him: "You are making such rapid progress in placing the brightness where it is needed that I really believe that the days of prisms for use in stellar spectographs are numbered." This 1937 prediction has been borne out by a tremendous increase in the use of gratings and a growing demand for the limited number available.



Photos by Blakeslee-Lane, Courtesy of Armco Steel Corp.

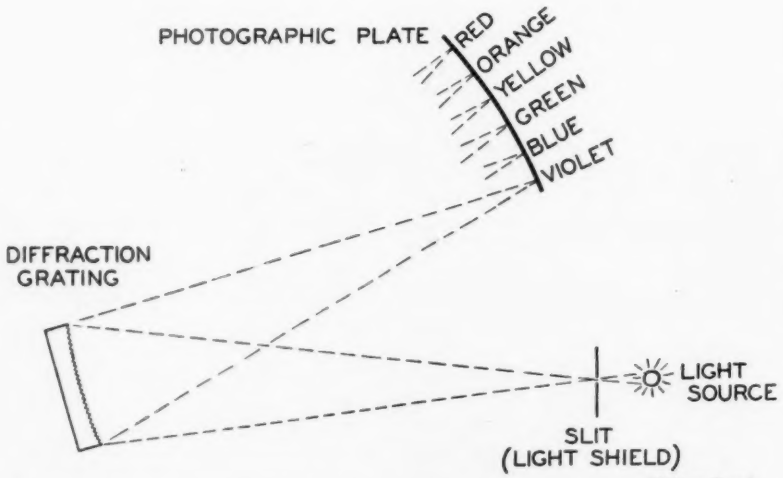
How Steel Is Tested

Molten metal is taken from blast furnace and poured into a mold (left). When solidified, sample is sparked in an electric arc; light is passed into a long spectrograph (center) where a grating diffracts it. Resulting spectrum is photographed. Picture is then placed in scanning device (right), a photoelectric cell converts the spectrum lines into curves on a graph, and operator reads the percentage of the component metals in the alloy.

by the grating and recorded as a spectrum on a photographic plate.

The plate is then passed through a densitometer which translates the intensity of the spectral lines into a graph record, the height of the curves corresponding to the intensity of the light. By comparing this record with the record of standard steel, the operator may determine the percentage concentrations of the elements in the sample. It is then an easy matter to direct additions to perfect the steel. By strict control of routine, steel mills have made the process so efficient that a report can be turned out in less than five minutes from the time the sample is taken.

The spectroscope is used with a number of metals to discover impurities. Twenty years ago it was found that steel made from scrap was often difficult to roll. Chemical analyses did not identify the trouble, but the more sensitive spectroscope revealed a tiny amount of tin in some scrap which was sufficient to harm the rolling properties of the steel.



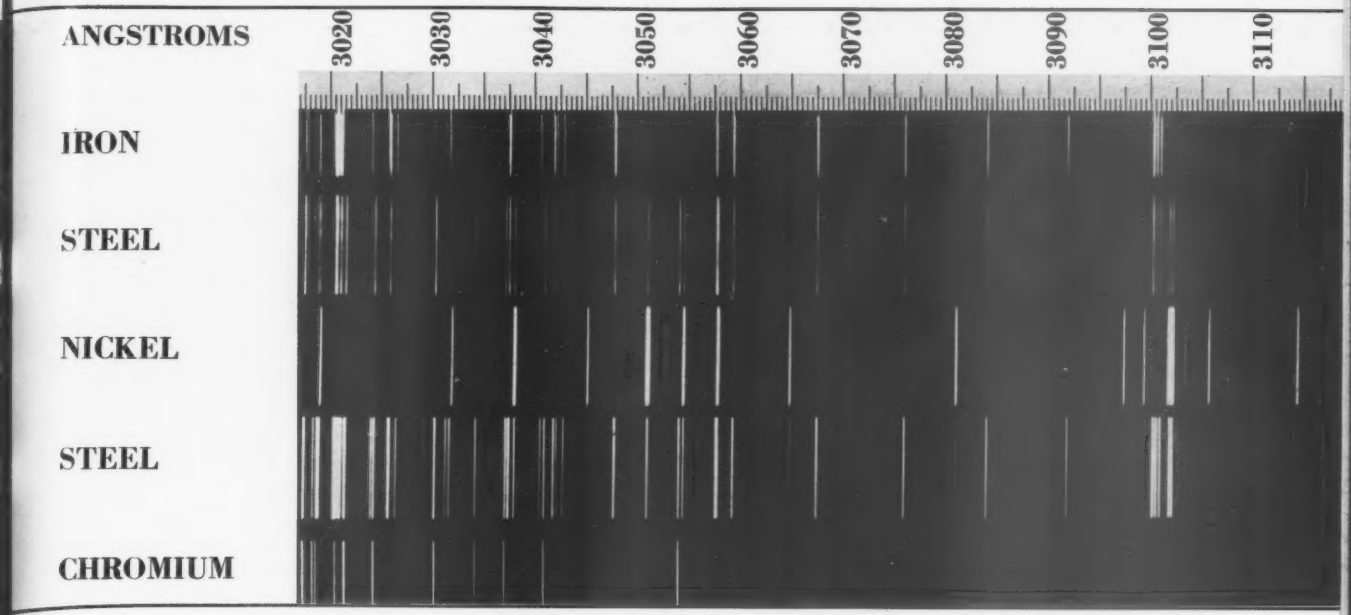
William Koenig

DIAGRAM SHOWS THE SIMPLE CONSTRUCTION OF A SPECTROSCOPE. At lower right is the material under study (atom, star, or condensed milk). The light is thrown on a concave grating, then reflected back to a photographic plate. The diffracted light now looks like a rainbow. The fine division shows one hundred thousand colors.

THE SMELTING of copper requires that the operator know the exact moment at which the impurities are best concentrated. The quick spectroscopic examination is invaluable.

Most of our information about the constitution of the stars has come by use of spectroscopy. The sun has been thoroughly analyzed, so that actually we know more about its elements than we do about what makes up the earth. Distant stars have been classified as to content, temperature, and type through the study of their light. Gratings have also given information about atmospheric conditions on the planets and allowed astronomers to estimate the possibility of the existence of living creatures on nearby members of the solar system.

The speed and direction in which a star is moving are readily discerned by the spectroscope. It all depends on changes in frequency, like the change in



SPECTRA ILLUSTRATE COMPOSITION OF STEEL. Comparison photographs show how the content may be identified by studying the spectral lines of the component parts of stainless steel. The second and fourth spectra (above) show the steel itself; first, third, and fifth are pure samples of three of the basic metals in the alloy. For example, the first and second lines in the steel spectrum may be traced as chromium; the third line, which looks heavy in the picture, is a combination of chromium and iron. The amount of each metal may be judged by the intensity of the line's light. In industry, comparison is made mechanically.

pitch observed in moving sound sources. If you are on a train approaching a crossing, the signal bell at the crossing will have a higher-than-normal note as you approach it, then will suddenly drop to a lower note as you pass and start going away from it. Obviously the frequency of the sound waves coming from the bell remains constant. However, the speed of the approaching train cuts down the distance between waves, making them of quicker frequency with a higher tone. When the train is going away, it spreads out the distance between waves so that the bell sounds lower in tone.

Similarly, a star moving toward the earth will have a spectrum with each line slightly above normal, one moving away will have a spectrum of lower frequency, and distance and speed can be computed by relating the spectrum to that of another star near at hand. So delicate is the spectroscope that it can detect the frequency difference on opposite rims of the sun, thus checking the direction and velocity of the rotation of the sun. In this manner, astronomers have discovered that the universe is expanding; the nebulae are rapidly spreading out to greater distances.

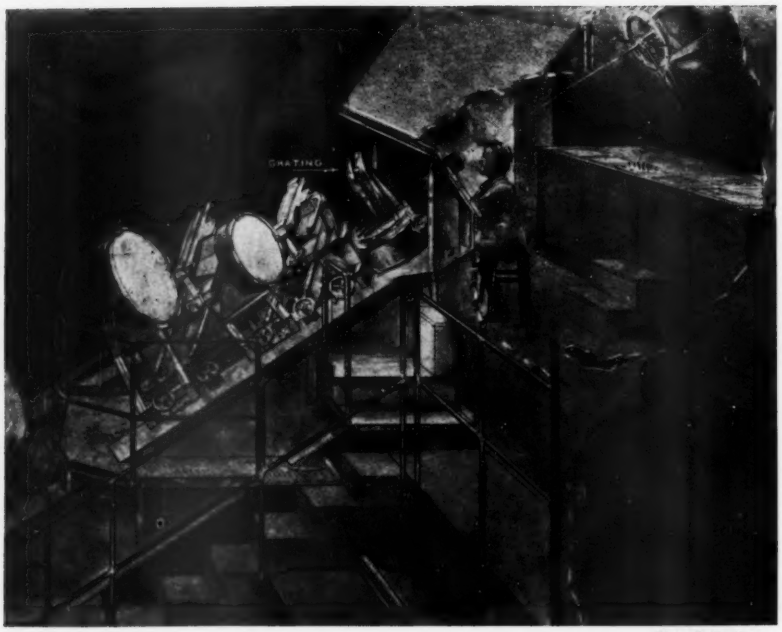
The same principle employed in studying planets can be turned on the tiny atom. With the assistance of gratings, physicists learn about the spin of the nucleus of the individual atom, and they can measure the mass of its various parts.

BIOCHEMISTS find that gratings can elucidate the steps between reactions, showing how a molecule is formed, helping to explain cell division, growth, and deterioration. Thirteen chemical elements were originally identified with the aid of gratings.

Gratings are remarkably sensitive to any change in an atom or molecule. The movement of one electron causes the spectrum to change radically. Hopkins physicists G. H. Dieke and H. M. Cross-

FEDERAL BUREAU OF INVESTIGATION and police laboratories use grating spectrographs to make positive identification of blood on a knife, paint specks on a burglar's jimmy, poison suspected in human organs, or the residue from an incendiary fire.

Courtesy F.B.I.



Russell W. Porter

NEW GRATING SET-UP now being installed in Cal Tech's Mt. Palomar telescope. Dr. Robert Wood's gratings have been responsible for great advances in astronomical knowledge.

white have experimented with the ionization of atoms. By shifting an electron within an atom and then recording spectroscopically the intensity of the light emitted as the atom returns to its normal "grounded" position, they can determine the electronic energy within the atom. Similar measurements can be made with split molecules.

Biologists are using gratings to discover the makeup of complex organic molecules, such as penicillin and the vitamins. Vegetables and soil can be analyzed for the smallest traces of metals. If the scientist wants to know whether a carrot contains any cobalt, for example, he dries the carrot and burns it. In the ash he places a pure electrode, throws on the current, and reads the spectrum of the spark. By checking the cobalt line, he can tell whether the carrot contained any of that metal.

Impurities in food are easily checked with a spectrograph. Condensed milk, chocolate, canned beer can be sampled for minute amounts of metal. A very small portion of oleomargarine mixed with butter will be shown up by a spectroscope.

Doctors are finding the spectroscope increasingly useful. In certain industries, for example, factory workers breathe metallic dust, always in the air, which in time may be sufficient to injure their health. The spectroscope can sight the danger long before the metallic accumulation is sufficient to harm a man.

Gratings even benefit archaeologists. Often a spectrum test can fix the date at which an antique urn was made. Dr. Wood turned the spectroscope on King Tutankhamen's gold ornaments and rediscovered the method of tinting gold, a secret which had been lost for thirty-three centruries.

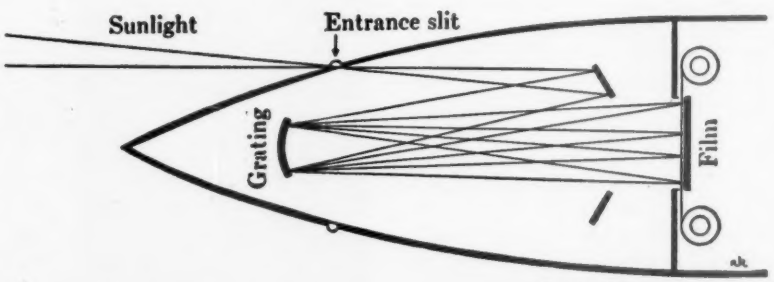
Many spectroscopes still are made with glass prisms, rather than gratings. However, the general belief is that the gratings are far superior. They have a larger dispersion and resolving power, and a single grating can be used on a much larger portion of the visible, ultra-violet, and infra-red spectrum.

A concave-mirror grating is considered the best type of all. The light does not need to pass through any glass, which might distort the image or absorb light. Further, the curve may be varied and the rulings may be shaped (by shifting the cutting diamond) so that the grating will focus the light as desired. It has been found that an $800 grating can do the work of a $10,000 prism. So far Hopkins has not been able to keep up with the demand for gratings, but the new machine halves the time required to produce the instruments and should make them quickly available to far more laboratories than before.

DR. STRONG'S machine may also be the answer to a large unsolved problem in manufacturing gratings, that of size. The largest accurate grating which could be made on the Rowland model was only six inches long. And the construction principle of the machines was such that the size of the grating could not successfully be increased by simply making a bigger ruling machine.

This has made it necessary to use mosaics of gratings when a larger one was wanted. This very difficult job is usually done with plastic replicas, as in the 18-inch grating which Dr. Wood made for the Mt. Palomar telescope. He poured plastic over a glass grating, let the plastic harden into a thin sheet, and then peeled it off. A mosaic of fifteen of these replicas was needed for the telescope. Although good, the replicas are not up to the originals in accuracy.

Dr. Strong hopes that the new machine, of a completely different structure from Rowland's, will prove capable of expansion to produce gratings more than a foot square. If this can be done, scientific knowledge is expected to advance much farther into many hidden fields.



Fortune Magazine, December 1948

V-2 ROCKETS sometimes carry a spectrograph to record ultra-violet spectra. The film makes several pictures each flight. The records are preferable to spectra taken from the ground, since they are made above the ozone which absorbs most of the ultra-violet rays.

ABEL THE PROPHET

Hormone research, an artificial kidney, "blood bank"—in envisioning all these things, Hopkins' first professor of pharmacology was far ahead of his times.

By E. K. MARSHALL, JR.

DR. ABEL IN HIS LAB IN OLD PHYSIOLOGY BUILDING

IN THE FALL of 1936, the sulfa drugs were just beginning to be used in this country. Within a decade, better sulfa drugs were introduced and less toxic and more effective remedies like penicillin and streptomycin cured many forms of infectious disease. However, in that autumn of 1936, I knew that few appreciated that the introduction of the sulfa drugs would completely revolutionize the treatment and importance of infectious disease, that they would make Ehrlich's dream of a harmless magic bullet with which to cure disease almost come true.

On Christmas Eve of that year, I called on my old teacher, colleague, and friend, John J. Abel, and found him very busy in his laboratory. Having known him for over a quarter of a century, I realized that the time was not ripe to sit for a long chat, and without removing overcoat, I sat down and talked with him for the duration of one cigarette.

When I arose, the old gentleman in a fatherly way put his arm around my shoulder and very politely piloted me to the door. When we arrived there, he stopped for a moment and, more as a gesture of politeness than anything else, he asked me what I was doing now. I told him I had been very busy all fall with the pharmacology of the new antibacterial remedy, sulfanilamide. He said, "That's fine," then jerked up and with a characteristic lift of the eyebrows, "What's this all about?"

He asked a couple of searching questions and then led me back into the room. "Sit down, take off that coat, smoke a cigarette, and tell me all about it."

"Oh, but you're very busy, Professor. I'll come over some other time," I replied.

"Never too busy to hear about things like this, my boy," he said.

For a half hour or more, I told him what I knew about this new development in medicine. He asked some very pertinent questions, and then raised his head and with a faraway look said, "My God, Marshall, wouldn't Paul Ehrlich turn over in his grave?"

This seventy-nine-year-old scientist saw at once the great significance of what had happened and had such a vision of the future that the miracles of the next decade would not have surprised him if he had lived to see them. This breadth of vision in foreseeing important developments of medicine was one of the qualities which was responsible for much of Abel's success and greatness.

JOHN JACOB ABEL belonged to that small group of men who made up the first faculty of the Johns Hopkins

DR. MARSHALL is Professor of Pharmacology and Experimental Therapeutics at the Johns Hopkins University.

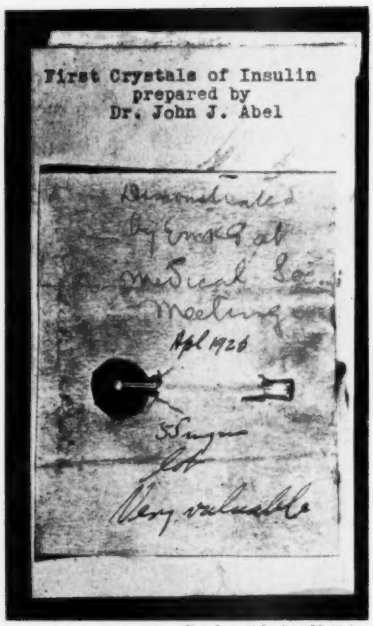
School of Medicine, and, in addition, was one of the pioneers who helped build up scientific medicine in America to the high place which it now occupies in the world. This is not the place to review Abel's contributions to science, which covered many subjects during a period no less than half a century. However, I shall try to point out many instances of his prophetic vision in regard to the future developments which were to take place in medicine.

The life of this first professor of pharmacology in the Johns Hopkins University began on a farm near Cleveland, Ohio, on the nineteenth of May, 1857, and ended in Baltimore on May 26, 1938, after a long career in American experimental medicine. His family came from the Rhine Valley of the Palatinate. He had no scientific forebears on either side. There is reason to believe that he owed his college education to his own initiative.

He received his Ph.B. degree from the University of Michigan in 1883, but had an interim of three years in his college course, during which he served as principal of a high school at La Porte, Indiana, where he taught Latin, mathematics, physics, and chemistry. Abel must have looked back on these years with satisfaction, for it was in La Porte that he met a teacher in his school, whom he once described as a "very sweet, mild little lady with a great deal of force." This lady, Mary Hinman, became his wife and was his companion for fifty-five years. She stood by his side through many tribulations and encouraged her husband to acquire a broad medical and scientific education. There can be no doubt but that Abel's happy family life was a potent factor in his scientific career.

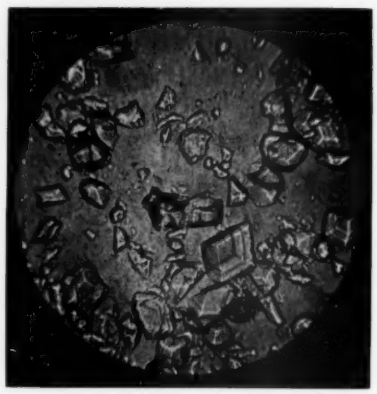
AFTER graduation, Abel set his course definitely for scientific medicine as his life's work. Two things which he did at that time indicate his ability to see what scientific medicine was to be like in the future. He submitted himself to a prolonged, broad, fundamental training, which consisted of a year with Newell Martin in physiology at the Johns Hopkins and then seven years with some leading teachers in the medical schools of Europe. He thus acquired not only a medical degree, but a broad scientific education, and was prepared for scientific medicine in a way which in this country was only recognized as the correct one some thirty or forty years later.

Also, there can be little doubt that



Reather, School of Medicine

DR. ABEL was the first to obtain insulin in chemically pure crystalline form. He isolated the hormone when he was sixty-nine years old. For months after he first did it, he was unable to repeat the performance, and many chemists were skeptical of his achievement. Ultimately he found the answer and crystalline insulin is now commercially prepared. Below, how Abel's first insulin crystals (still kept at Johns Hopkins) appeared under the microscope.



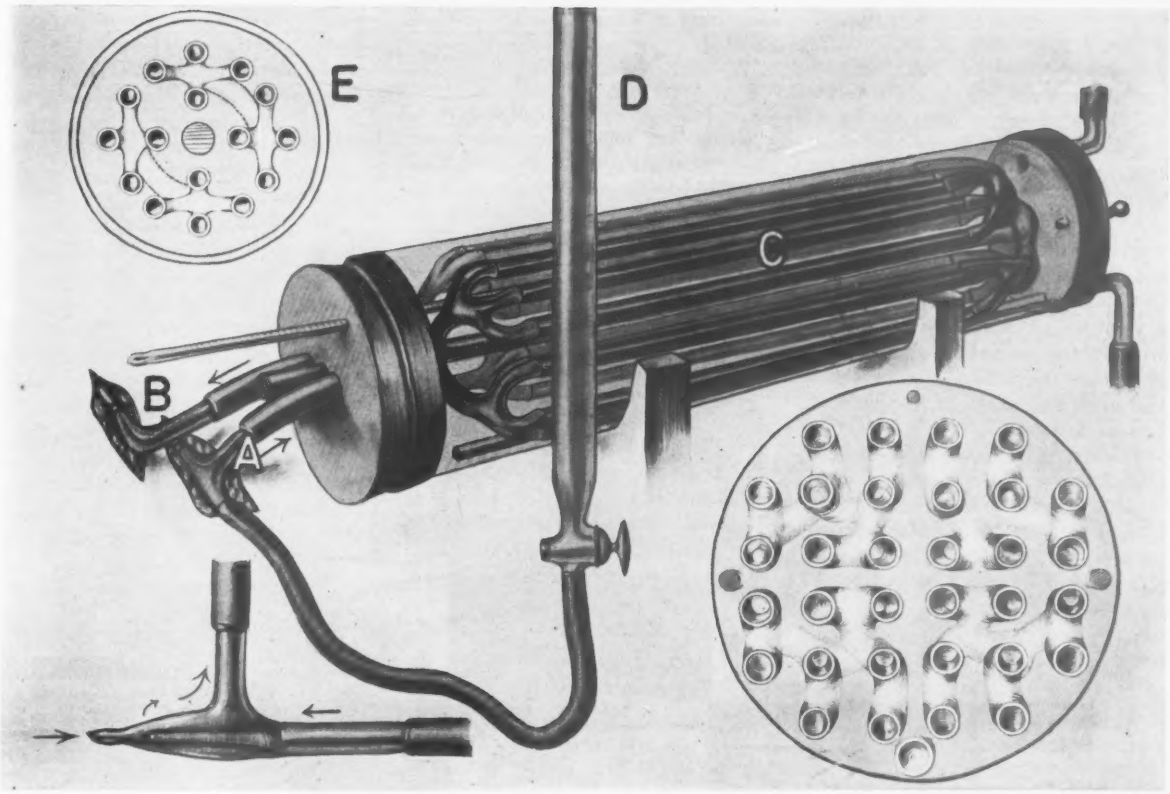
at this time Abel had a clear vision of what a tremendous role chemistry was to play in the future of scientific medicine. Irrespective of the expense, which he could ill afford, he determined to be prepared for this coming development. While in Europe in 1889, he frequently mentions in his letters the need of medical chemistry in the hospitals in this country and wants to come back to the States with some entirely "new line" of work as well as to get "ready for the twentieth century." Although many of his colleagues at that time thought his ideas absurd and visionary, everyone now realizes how justified this vision of his in regard to chemistry in medicine was.

Very soon after coming to the Hopkins in 1893, his interest developed in the glands of internal secretion (the endocrine glands) and indeed in the isolation of their active principles or hormones. He first tackled the thyroid gland and was busily engaged on this project when news of Baumann's work on the iodine-containing iodothyroglobulin came out. He stopped the thyroid work, but soon became interested in the hormone of the adrenal medulla, which had a remarkable blood-pressure-raising action.

When one considers the tremendous importance in medicine of this field of the endocrines (or hormones) at the present time, one can only think of Abel's early interest as prophetic. It is now well recognized that the key to many problems connected with each endocrine gland is to be found in the isolation of the pure active principle. That he early appreciated the importance of such contributions is shown by the following sentence in one of his addresses: "The actual finding of definite and specific chemical principles in the organs of internal secretion has in each case an importance in the way of explaining and correlating a large number of disconnected facts, only to be likened to the discovery of the etiological cause of an infectious disease." He was fond of emphasizing the importance of the powerful drugs present in the human body in the aphorism, "We are walking drug stores."

TO RETURN to Abel's first published research on the hormones, it is well known that in 1897, he isolated the active principle or hormone of the adrenal medulla in the form of a benzoyl derivative. This was the first instance of the isolation of a hormone of any endocrine gland. Later, the pure substance was isolated without the benzoyl radical. This substance has been called epinephrine or adrenaline and has been used in medicine for the past half century.

Scarcely a night passes in the accident room of any large hospital that patients suffering from asthma are not given an injection of epinephrine, which gives dramatic relief to these sufferers in the course of a few minutes. Many individuals covered with urticaria (hives) obtain complete relief from this troublesome



The Johns Hopkins School of Medicine

"ARTIFICIAL KIDNEY" WAS ENVISIONED BY DR. ABEL years before one was finally developed which would work on human patients. The view above, reproduced from an old drawing, shows the artificial kidney used by Dr. Abel on animals in 1913. A cannula (tube) was inserted in the animal's artery (A) to lead blood into the device's diffusion apparatus (C), a series of collodion tubes through which the blood flowed and from which substances in the blood were diffused into a fluid introduced from outside. A cross-section of these tubes is shown in the circle at upper left (E). Anticoagulant was introduced through the burette in center of drawing (D). Blood was returned to vein of animal through upper cannula at left (B).

condition by an injection of epinephrine. Due to the fact that this substance causes a marked constriction of blood vessels, it is used thousands of times every day in connection with local anesthetics. Every time a tooth is extracted, every time a minor surgical operation is performed, this substance is used in connection with the local anesthetic.

Opinions may differ as to how much credit should be given to Abel as the one responsible for the isolation of the first pure hormone. It is quite true that he did not obtain the hormone of the adrenal medulla as such but only in the form of a derivative, and it is equally evident that during the decade in which he was engaged in this problem, he fell into many pitfalls and made mistakes. It is now well known that the so-called pure hormone obtained from the adrenals is a mixture of two substances, epinephrine and nor-epinephrine. Be that as it may, no one can detract from the importance of Abel's pioneering work in making available this valuable medicinal for research and therapy.

Shortly after the hormone insulin, which has revolutionized the treatment and progress of diabetes, was discovered, Abel interested himself in an attempt to obtain the hormone in chemically pure crystalline form. This he succeeded in doing in 1926, in spite of his sixty-nine years and his quaint and antiquated methods of chemical procedure. This was the first isolation in pure crystalline form of a hormone which must be considered as a protein.

Abel's announcement of the crystallization of insulin was received with skepticism by many chemists as a final proof of the isolation of the pure hormone. The criticism was made that the highly potent true hormone was adsorbed on a crystalline protein. But all criticisms were finally met and Abel's great achievement of the chemical isolation of insulin in pure crystalline form was soon completely established. It is amusing to recall that for many months after the preparation of the crystals, Abel himself was unable to repeat the performance. He never, however, lost faith. Ultimately, he found the answer and crystalline insulin is now commercially prepared.

This great optimism in regard to the outcome of his researches is well illustrated by incidents which occurred during his efforts to isolate in pure form the hormone of the posterior pituitary gland. An assistant who was testing Abel's preparations for pharmacological activity tells me that after he had tested dozens of preparations and found them all inactive, Abel would come to him with a new one and confidently say, "I've got it this time." After an evening of testing, the assistant informed Abel the next morning that the preparation was completely inactive and was greeted, "It's probably left in the mother liquor. We'll be sure to get it next time." This abiding faith, optimism, and enthusiasm in spite of great difficulties and disappointments marked Abel's career.

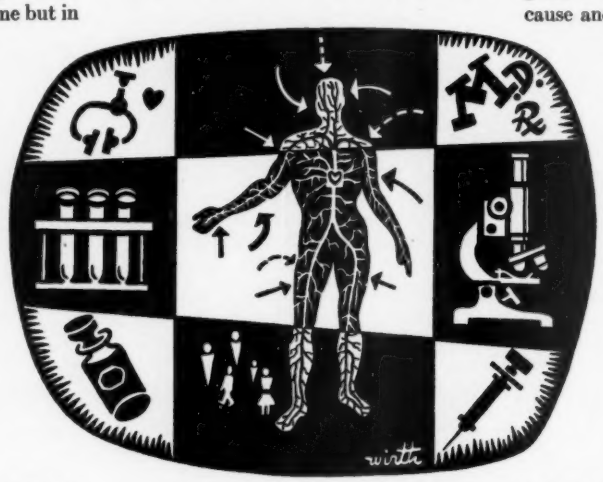
In 1913, Abel became interested in a potential method for the removal of diffusible substances from the circula-

ting blood of living animals by dialysis. At the first inception of the work, he discussed his idea and plans with his staff at the luncheon table. The author can clearly recall this particular luncheon meeting. The professor used small cylinders of bread to illustrate how the apparatus was to be made and talked glibly about how this "artificial kidney" would be valuable to provide means for the removal of substances detrimental to the body in order to relieve the kidneys of their function and tide over a crisis. At this conception of the idea, he clearly saw the possibility of the use of his "artificial kidney" as a therapeutic measure for man.

The task was to pass the blood of an animal from an artery through a series of collodion tubes surrounded by saline solution back into a vein. Many technical difficulties had to be overcome but in November, 1913 the first successful experiment was performed on a rabbit. When the "old man" talked of the clinical application of the measure for the treatment of intoxications or to tide over when the kidneys were not functioning, his associates, including the author, considered him a bit of a visionary. In 1926, Haas of Giessen actually used an "artificial kidney" on three human patients. It was not, however, until 1946 that Kolff in Holland and Murray in Toronto were able to put the "artificial kidney" on what appears to be a workable basis. Great technical improvement has been made, but the idea and general principles are the same as those developed by Abel a third of a century before.

In connection with his studies on the "artificial kidney," Abel found from experiments on dogs that very large quantities of blood can be withdrawn repeatedly, if the red corpuscles of the blood are separated and reinjected in salt solution. The paper (1914) dealing with this work contains the following prophetic sentence: "In view of the fact that mammalian corpuscles retain their stability for three or four days when kept on ice, a supply of human corpuscles might possibly be kept in this manner in operating rooms for rapid injection in emergencies that would otherwise prove fatal." Here we have the fundamental idea of the "blood bank" which came into use only recently and which was of such great value in the treatment of wounded soldiers in World War II.

IN THE summer and fall of 1921, he became very much interested in biophysics, and wanted a department established in the Medical School. Actually, during the academic year 1921–22, biophysics is listed in the catalogue as a department of instruction. It was in charge of a lecturer in biophysics but was really under Abel in the Department of Pharmacology. Fortunately or unfortunately for the School at this time, the department only lasted a year, and Abel's attempts to get his colleagues to continue it proved unsuccessful. Today, biophysics is recognized as an important University department at Hopkins. It may be mentioned that at the time of his biophysical enthusiasm, Abel purchased from his limited funds an infra-red spectroscope and had an assistant for two or three years working with it. Today, infra-red spectroscopy is recognized as a valuable tool in organic chemistry.



Lastly, in a prophetic way, I can mention his intense interest in scientific journals and in the organization of national scientific societies. In view of the fact that he refused to allow himself to be sidetracked from his devotion to research to figure in the usual accompaniments of a successful scientist, medical meetings, committee meetings, and board meetings, it is somewhat difficult to explain his interest in scientific journals and scientific societies. The answer appears to be that he saw clearly the necessities of journals and societies in biochemistry and pharmacology and interested himself in them so that they might be properly launched.

Abel was first and foremost an investigator. His great enthusiasm and passionate devotion to research dominated his whole life. In one of his addresses, after discussing the training necessary for the medical investigator, wherein an extended chemical training is emphasized, he writes:

"But to what end is all this preparation for our young man? Is it solely that he may solve problems whose solution is of practical value to mankind? Is his mind to shape itself only to the insistent demands of utility? Even then our method of training will yield the largest profit.

"But it does vastly more than that. Thus trained, our young scholar will be able to see beyond the immediately practical problem, even though it be as great a thing as the discovery of the cause and cure of the plague that decimates a people. *Greater even than the greatest discovery is it to keep open the way to future discoveries.* This can only be done when the investigator freely dares, moved as by an inner propulsion, to attack problems not because they give promise of immediate value to the human race, but because they make an irresistible appeal by reason of an inner beauty.

"Some of the greatest investigators indeed have been fascinated by problems of immediate utility as well as by those that deal with abstract conceptions only. Helmholtz invented the ophthalmoscope and thus made modern ophthalmology possible, and at the same time did work of the highest order in theoretical physics and wrote on the nature of mathematical axioms and the principles of psychology. Lord Kelvin took out patents on great improvements in the compass and on oversea telegraphy and also made contributions to our knowledge of the ultimate constitution of the atom and the properties of the ether.

"FROM THIS point of view the investigator is a man whose inner life is free in the best sense of the word. In short, there should be in research work a cultural character, an artistic quality, elements that give to painting, music, and poetry their high place in the life of man."

THE CLASS OF 1950

Who are the men who make up the graduating class this year? What has been their effect on the University? Where are they heading? A Johns Hopkins senior offers some answers.

By BEN HERMAN

THE SCENE will be familiar: seniors dressed in black gowns and tasseled caps . . . speeches, applause, row on row of folding chairs on the green lawn of Gilman Terrace . . . proud parents and friends . . . a platform on the steps of red-brick Gilman Hall. June 13 is commencement day for the Class of 1950 at Johns Hopkins. On the surface it may look like many other commencement days that have gone before.

But somehow, graduation for the Class of 1950 cannot be classed with those of former years as "just another commencement exercise." When this year's seniors receive their degrees, the curtain will ring down on one of the most significant periods in the history of United States collegiate education: the years from 1946 to 1950.

The Class of '50 is significant in several respects. In physical size, it is larger than its companion classes during the period, the Classes of '47, '48, and '49. An estimated 500,000 students will graduate across the country, a peak number not likely to be reached again in the near future. Last year about 422,000 received degrees—a record at the time; next year the total is expected to decline.

The over-all figures show that the Class of 1950 at Johns Hopkins will be just a bit larger than last year's graduating group: this month 394

MR. HERMAN, a member of the Class of 1950, served in the Army before coming to Johns Hopkins. He is associate editor of the Johns Hopkins *News-Letter*.

"Possibly one of the best examples of the veteran's influence can be found in the pages of the weekly undergraduate paper, the 1948–49 News-Letter."

students will step forward for their degrees, compared to 378 last June.

Although the size of the class is somewhat larger, the percentage of veterans has declined considerably. In the Class of '49, seventy per cent of the graduates were ex-servicemen; this year's veterans compose about fifty per cent of the class.

The Class of 1950 at Hopkins, according to the professors, is one of the most mature groups to graduate from the University—second, perhaps, to the class of the year before. The forty-niners, *Fortune* Magazine remarked last spring, were the "most self-disciplined group that colleges ever had"—and not as restless or as hard to handle as the Class of 1946. The Class of 1950 at Hopkins, although probably not *the* most self-disciplined, can be described fairly as a responsible group of young men who are adjusted to the career difficulties they are likely to face.

WHO ARE THESE MEN who will graduate as members of the Class of 1950? What has been their effect on the University? Most important of all, where are they heading?

Answers can be given for the first two questions without too much difficulty. The one regarding our future, however, can only be answered with speculation; even a swami with the aid of a crystal ball would undoubtedly complain about the hazy picture ahead.

So before delving into the future, let us examine the first two questions. First, just who *are* these 1950 seniors? Article writers make frequent reference to the "average" senior; in past years (1949, for example, when veterans were a large majority of the graduates), there may have been such a man, but the 1950 class offers the writer no such convenient "average" senior.

ILLUSTRATIONS BY
ROBERT J. WIRTH

This year's group at Johns Hopkins is split on a fifty-fifty basis: half are veterans, half are not. Even veterans cannot be considered a homogeneous group; although most of the '49 veterans had seen war action, the same thing cannot be said of the 1950 ones. Together with combat soldiers, the Class of 1950 has its share of young men who served in the occupation forces in Europe and Asia—and there is a difference in the outlook of the two groups.

WHAT HAS BEEN the effect of the Class of 1950 on the University? We will have to go back four years, to February, 1946. This was the month when the first large influx of veterans entered the University. The lecture halls and classrooms presented a colorful (and in some respects a rather strange) picture: youngsters fresh from high school sitting beside Cassino and South Pacific veterans. There was a generous number of blue Navy coats, Eisenhower jackets, and khaki pants in the picture. The returning serviceman, the non-veteran, and the University faced a big problem—one of adjustment.

In 1944, for instance, the general survey course in history was given to less than fifty students in a Gilman Hall classroom. In 1946 the course had to be moved to a large auditorium in Remsen Hall, where over three hundred history students could be accommodated. The administrative problems were twofold: finding enough rooms, finding enough instructors.

The members of the Class of 1950 adjusted themselves to these problems. "Bigness" became more or less taken for granted.

But bigness was not the only change that came about. During the period from 1946 to 1950, the University was dealing with an unusually serious-minded young man, eager to get the most from college and in some cases a bit impatient to do so. One college administrator (not at Hopkins, incidentally) tagged the veterans joshingly as D.A.R.'s: damned average-raisers. Many of the veterans were married, and naturally their extracurricular activities were kept to a minimum. Many of them, however, did find time to participate in campus activities: student

government, athletics, publications, the dramatic groups, and many more.

Possibly one of the best examples of the veteran's influence can be found in the pages of the weekly undergraduate paper, the Johns Hopkins *News-Letter:* stories about the Veterans Administration, government allowances, the bookstore and veterans' books. The pages of the paper also provided the veterans with an opportunity to express themselves; they took advantage of that opportunity and came through with a special sixteen-page issue, "the Bowman issue," which reviewed President Bowman's contributions to the Hopkins during his thirteen-year term of office. Editorials, news stories, and special feature articles, including significant contributions by Richard Sonnenfeldt, chief interpreter at the Nuremberg war trials, reflected the maturity of the classes. These men, however, could take time out from their serious ventures to produce an "Eclipse" of the Baltimore *Sun* (a takeoff of the local newspaper).

The Class of 1950, along with the other classes, '47 through '49, left a very definite impression on the University. But it has not been a one-way proposition. Although some seniors take a negative approach and say that "cramming, impossible tests, and bad conditions in general" are the only things that they have "gained" from their four years at the University, many members of the Class of 1950 take a kinder view.

The truth of the matter is that most seniors, as one of them put it, have been "too busy to reflect yet about the past four years." Now and then, however, you can sit in on a group of seniors in Levering Hall who give some thought to their "pasts." Quite true, there are no watery eyes when they reminisce; that may come later.

The Road Ahead

BIG INDUSTRIES, "who could not hire bright young men during the long war years, are suddenly finding themselves short of junior executives. Technical concerns need lots of college-trained technicians. . . . Personnel representatives of the biggest U. S. companies have been jamming college placement offices to fight over likely job recruits. Bright students are flooded with offers. Even an average student can have his pick of three or four good jobs. . . ."

That was the outlook for the Class of 1948, according to *Life* Magazine.

"They will have to hunt longer and harder than their immediate predecessors before they find the jobs they want."

The Class of '48 was one jump ahead of the flood of graduates that poured into the labor market in 1949. And this year, 1950, the flood will rise to its highest crest.

What are the prospects for members of the Class of 1950—those who are ending their university careers this month, rather than going on to graduate school? Secretary of Labor Tobin, in an open letter to college seniors, paints the following picture:

"On the average, you . . . will have to hunt longer and harder than your immediate predecessors before you find the job you want and for which you are trained.

"The very size of the graduating class will intensify the competition for jobs when you seek employment. Furthermore, it is likely that there will be fewer job openings for new college graduates this year than there were two years ago. . . ."

Reports and surveys conducted by various agencies confirm Secretary Tobin's statements. *United States News and World Report* reached these conclusions: "Jobs will be harder to find, pay not so attractive, choice of work narrower. . . . There is a strong prospect that some 1950 graduates will be added to the ranks of the unemployed."

But the job outlook for the college graduate may not be as bleak as one might expect. It is "generally good," says the Department of Labor, "but

"If you want to land a job this year you've got to organize a campaign."

not as good as in 1947 and 1948." Basically the economy of the country is strong and there is a general consensus that production and employment will remain high during 1950.

In teaching, there is an acute shortage of personnel in the elementary schools and a growing oversupply at the high-school level. Last year, only one student completed training for elementary teaching for every three who were needed; this year, the shortage persists. The number of students completing preparation for high-school teaching in 1949, by contrast, was four times as great as the demand; the excess in 1950 is expected to be even greater.

Liberal arts graduates with work experience or specialized training will find it easier to get jobs than those with only a general undergraduate education. According to Labor Department reports there will probably be an oversupply of business administration graduates. And forecasts indicate that there is already a surplus in the field of accounting.

In the Baltimore area, prospects for business and liberal arts students are somewhat brighter. Robert Biunno, director of the Johns Hopkins placement bureau, says that many companies are interested in liberal arts and business students for sales positions.

Dean Edward R. Hawkins of the School of Business says that the local job situation in business is "pretty good—much better than last year."

In chemistry, competition will be keen for the next few years among persons without graduate degrees. Law, journalism, and personnel work are tight fields, with no immediate signs of an easing of the situation. The engineer, along with his classmates in other specialties, will find the road ahead a difficult one. But although the number of engineering graduates will exceed the number of openings in the early 1950's, the employment situation for new graduates is likely to improve after the next four or five years, say the analysts.

IS THE 1950 SENIOR prepared to meet this tightened employment situation? The majority are realistic enough to realize that the problem today is not one of "What do I want?" but "What can I get until the right thing comes along?" The gentlemen with "skill, talent, and imagination" who are sitting back waiting for employers to beat a path to their doors are in the minority. For the most part the Class of 1950 contains men who are alert, aggressive, and down to earth. Although concerned about their future, they are not panicky.

The Hopkins senior is adjusting himself to the employment problem in a variety of ways. One mathematics major observes that "the door-to-door system for getting a job rarely works. And letters to employers are just as bad—not even a tumble. If you want to land a job this year you've got to organize a campaign. You've got to get out and see people—and most important of all, make a few good contacts."

The campaign technique is fine for some seniors, but a twenty-five-year-old veteran, majoring in physics, has another idea: "The B.A. degree doesn't mean too much these days. They won't even talk to you at all if that's all you have. I think that the wisest course is to go to graduate school, get another degree and then get in with one of the big companies."

The campaign and advanced training: these are two ways that the senior is using to meet the job problem. There are also certain students who express a bitterness about their situations. Here are the words of an electrical engineer: "They're after the geniuses, the top boys, the brains. Those fellows never have to worry. As for me, just an average student, I'm up the creek. It's just my luck to be in a field where there are more graduates than they know what to do with."

Wanted: "a nice home, a car, two children . . ."

The Goal: Security

THE MEMBERS of the Class of 1950—veterans and non-veterans, single and married, engineers, liberal arts and business students—are all seeking that something called "Security." Some may actually define what they mean by the term. Others are a trifle hesitant; to them the word "smacks of socialism"—and if there is one thing they are against, it is socialism. They prefer to define what they are looking for in more definite terms: "A well-paying job, a nice home, a car, two children, and a bank account to fall back on."

There are exceptions, however; those

Continued on Page 31

Blakeslee-Lane

Having raised and tested around ninety generations of the insect, Dr. Vincent Dethier has learned a lot about

THE EPICUREAN BLOWFLY

THE FLY, of whose number millions have already made their presence felt this spring, is a most discriminating insect. Memorial Day picnickers have had an opportunity to observe his discerning tastes: how he favors certain delicacies and scorns others; how he is attracted to the icing of one's cake, undoubtedly, while he may carefully avoid the vinegar on one's potato salad. For an animal scarcely the size of one's smallest fingernail, the

fly is an amazingly well-developed epicure, albeit a highly unpopular one.

Dr. Vincent G. Dethier, associate professor of biology at Johns Hopkins, along with a number of associates, has been conducting elaborate investigations into this business of the fly and his remarkable sense of taste. For some three years now, Dr. Dethier has been growing flies on the second floor of Mergenthaler Hall at Hopkins and putting them through myriad tests to determine how and why they choose certain foods to eat in preference to others. He has bred around ninety generations of *Phormia regina*, the blowfly; he has built ingenious devices to test them; and in the process he has learned things about the fly which men could only guess at before.

The fundamental-knowledge aspects of his work are important, but Dr. Dethier's interest in the fly is not purely academic. It has an intensely practical side to it, too: finding better fly repellents. Obviously, before one can develop an efficient repellent, one must have a pretty good idea of the likes and dislikes of the creature one is hoping to repel; and that is where Dr. Dethier's extensive studies come in.

It has been known for many years that flies, like butterflies and honeybees, taste things with their feet. As he walks across substances which taste pleasing to him, the fly reacts accordingly. He hungrily lowers his proboscis, or his retractible mouthparts, in a manner quite similar to that of an airplane lowering its landing gear. When he treads on things which his feet tell him are *not* pleasant-tasting, his proboscis stays put, unextended.

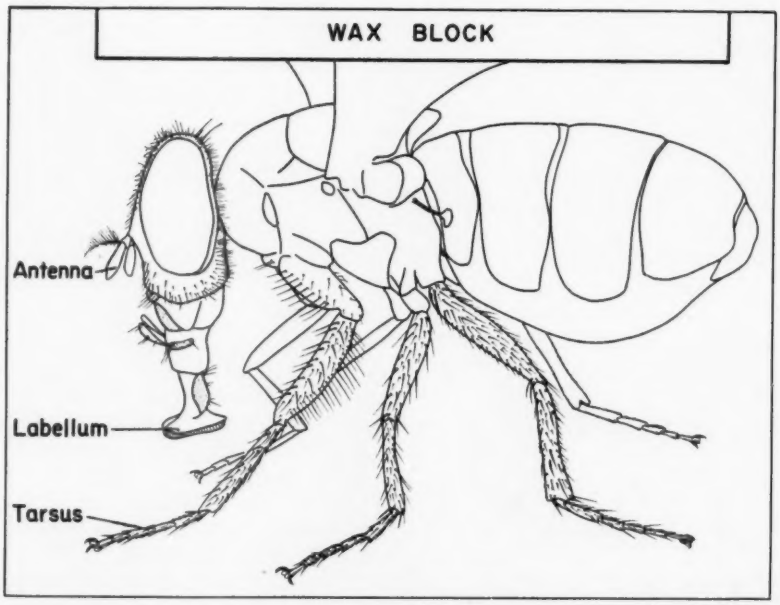
HOW CAN RESEARCHERS TEST a fly's sense of taste? These pictures show the process used by Dr. Vincent Dethier and his associates at Johns Hopkins to find what substances attract and repel the insects. First (picture at left), flies are anesthetized with carbon dioxide; next (second picture), their wings are fastened to paraffin on a wooden stick. While still

By observing the movements of the fly's proboscis as his feet come in contact with a substance, one can judge how receptive the insect is to that substance. Certain sugars rank high in the fly's favor; using them as a starting point and the fly's proboscis response as their guide, the scientists in Dr. Dethier's project set out to find what substances would repel, rather than attract, the insect.

They did this by adding various amounts of test substances to sugar, observing how the fly reacted to them. Lots of sugar and little of the test substance attracted the fly's proboscis as if it were iron filings irresistibly pulled by a magnet. But as the concentrations of some test substances reached a certain point, the fly declined to lower his proboscis. The test substance had grown so repugnant to him that the sugar in the mixture lost its appeal; and he rejected the food as beneath his princely taste.

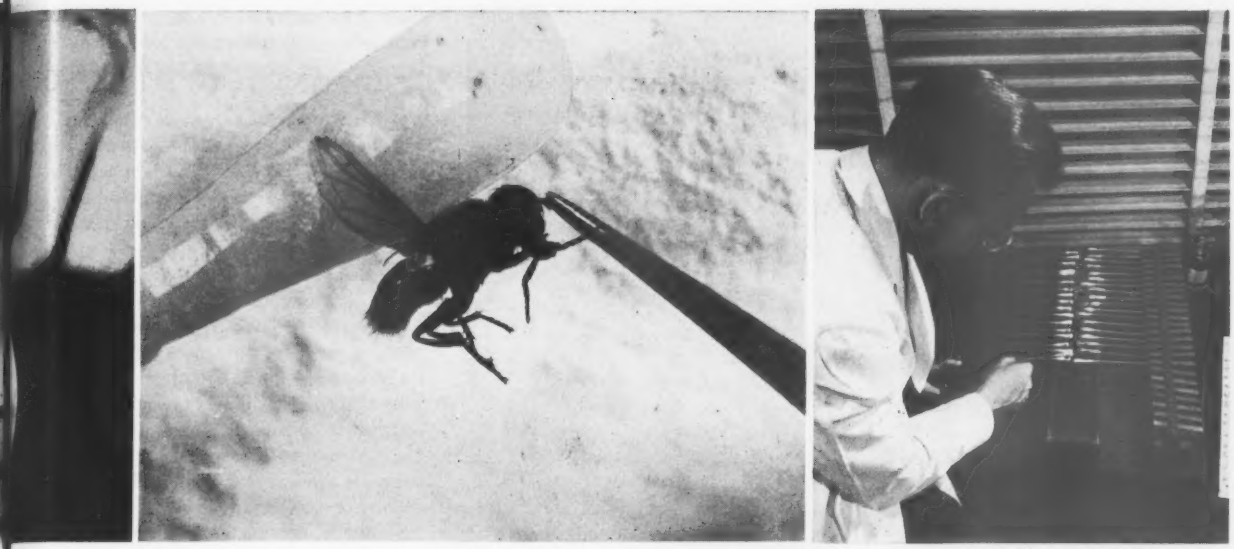
The point at which the sugar's attraction was first overbalanced by the test substance's repulsiveness was the fly's "rejection threshold" for that substance. Across the threshold, the fly would continue to spurn the food; as the sugar became more and more subordinate to the test substance, the mixture became more and more unattractive to the insect.

Using the method of simply touching the fly's feet to a substance and watching his proboscis response was a workable way of discovering the fly's rejection threshold only as long as the test substance had no odor. If there was an odor to it, the scientists would have no way of knowing, using this method alone, whether it was the substance's



Vincent G. Dethier

THE BLOWFLY. His sense of taste is in his tarsi (his feet), and his antennae and labella provide his sense of smell. Labella are part of fly's proboscis, or retractible mouthpart.



Photos by Leitch, Blakeslee-Lane

under anesthetic, the flies have their antennae and labella removed in the delicate operation illustrated in the third picture. These organs contain the flies' sense of smell. Next comes an overnight rest, and then the flies are ready to be tested. They are first given all the distilled water they care to drink (photo at right), to remove possibility that thirst might play part in their reactions to test fluids (below).

taste or its fragrance which was repelling the fly.

So to test the fly's reaction to organic compounds, many of which have a sufficient smell about them to stimulate the insect's olfactory organs, something had to be done to assure the scientists that only the fly's sense of taste would determine his acceptance or rejection of the substance. The investigators knew that in other types of blowfly the sense of smell is located in the insect's antennae and labella; simple checks showed them that this was true of the blowfly *Phormia regina*, too. They merely removed the antennae and labella from some of the flies and the obstacle posed by odoriferous substances was surmounted.

The process of getting a fly ready for the tests is a painstaking one. One-to-three-day-old adult blowflies are first given an anesthetic, carbon dioxide. While under the influence of the anesthetic they are mounted on a wooden swab stick by pasting up their wings with warm paraffin. Flies fastened in this fashion, if fed daily, suffer no loss in longevity; if freed at any time, they are still capable of normal reproduction. Their antennae and labella are removed. Then they get an overnight rest.

Next day the flies are given all the distilled water they care to drink, removing any likelihood that thirst may play a part in their receptivity to a test fluid. Then they are ready for the experiment.

The experiment consists of offering

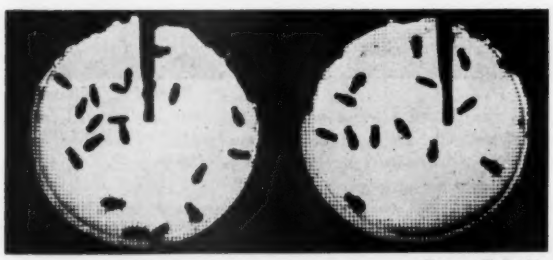
Weber, J H U Illustrations

IN CLIMAX OF TEST, flies are offered a series of test fluids, varying upward from plain sugar water to mixtures of test substances. As their feet are touched to the fluid, the flies (who taste with their legs) are stimulated by the substance. If they like it, they lower their proboscis (below); if not, the proboscis stays put.

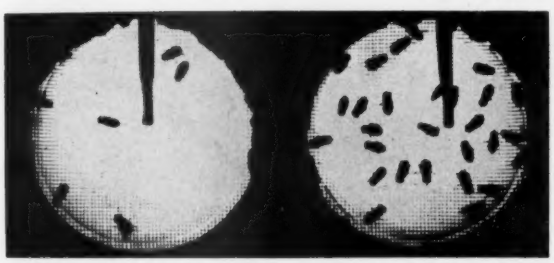
Spurbeck, J H U Illustrations

Blakeslee-Lane

FLIES' SENSE OF SMELL is tested in this instrument, an olfactometer. Far compartment is mixing chamber, where air and gases are prepared and blown through two holes in wall leading to black-painted section. Test flies are placed in this section, called reaction chamber. Camera (foreground) records flies' reactions to gases (below).



Vincent G. Dethier



FLIES REACT to gases blown into reaction chamber as shown in photos at left, taken inside olfactometer. In top picture, air is coming through both portholes, and flies, attracted by lights shining through holes, cluster evenly at both ports. In lower photo at left, air is still coming through hole at right but a test gas has been introduced into the one on the left. Flies find it repellent and, as picture shows, most of them move quickly away. Vertical shadows are thermometers.

the flies each solution in a series of fluids containing a finely measured concentration of a given test substance. First the fly may be lowered, feet first, to a dish containing plain sugar water; the liquid tastes good to him and he lowers his proboscis. Then he is offered the sugar water with a bit of test substance added to it; he still finds the dish to his liking, and his proboscis response is forthcoming. So on through an ascending order of test-substance concentrations.

Finally the point is reached at which the proboscis response does not occur. Failure to lower the mouthparts is interpreted as a rejection of the substance; but just to be sure, the researcher offers the fly the next lower concentration again; if the insect accepts it as he did before, it is virtually certain that his rejection of the next higher concentration was due to the substance itself and not to the fly's fatigue or some other behavior factor.

Following each test the insect's legs are washed with distilled water to remove any remnant of the old substances from his taste organs.

Using this method, Dr. Dethier and his co-workers have found the rejection thresholds for a series of aliphatic alcohols. Various physical properties of the alcohols—their boiling points, molecular moments, vapor pressures, and so on—have been carefully charted and correlated, to see if some common characteristic exists at the point of concentration at which they are rejected by the fly. Some property shared by all the alcohols, the scientists infer from their charts, a property varying in an orderly fashion with the molecular structure of the substances, seems to have a lot to do with the stimulatory process which occurs when the fly's feet are brought in contact with the fluids. This property has something to do with surface energy relationships, the investigators feel certain, but just how these relationships work is still beyond their ken.

DR. DETHIER has not confined his investigations to the fly's taste sense alone; odors, too, may be attractive or repugnant to the insect, and the scientists have given considerable attention to them.

How does one go about testing a fly's receptivity to smells? First, it is necessary to produce scented gases in known concentrations. Next, a satisfactory way of judging the insect's response must be devised.

Dr. Dethier uses a boxlike machine

Continued on Page 27

NEWS at Johns Hopkins

A digest of developments at the University and Hospital in recent weeks

THIS MONTH is the end of the University road for some and the beginning for others. On June 13, one of the largest graduating groups in Johns Hopkins history will march into the green-arched quadrangle before Homewood's Gilman Hall for commencement exercises, and march out with B.A.'s, B.E.'s, B.S.'s, M.D.'s, Ph.D.'s, Dr. P.H.'s, and other degrees signifying the attainment of high goals. Six days later, on June 19, the first classes in the University's Summer Session will convene.

June at the Hospital will be like many other months, for the work there knows no seasons, no holidays, no end of a road. But the foliage and flowers will be thick on North Broadway and in the Hospital courts, and there will be a summer hum through the windows. New internes, fresh from medical schools, will begin to arrive; there will be newly won caps among the nursing staff; in some departments new residents will take over, reaching hard-won goals. And everywhere, the work will go on.

Summer Session

Summer Session at Johns Hopkins has many features which set it apart from the rest of the University year. In six weeks (eight for classes in chemistry and general biology), Summer Session students may take concentrated courses which in many subjects are equivalent to a full term or even to a year of regular

Phillips Studio

Weber, J H U Illustrations

HIGHEST HONOR IN AMERICAN SCIENCE has been accorded Johns Hopkins President Detlev W. Bronk (left) with his election to the presidency of the National Academy of Sciences. When he starts his four-year term next month, Dr. Bronk will be the third Hopkins man to hold the position, marking the first time one university has supplied three Academy presidents. His Hopkins predecessors were Ira Remsen and William Welch. Dr. Bronk is also chairman of the National Research Council, operating agency of the Academy.

Two other members of the Hopkins faculty were elected members of the Academy at the April meeting: Dr. Kenneth F. Maxcy (center), professor of epidemiology, School of Hygiene and Public Health; and Dr. Ernst Cloos (right), professor of structural geology, Faculty of Philosophy.

study. They may take part in an after-hours recreational program specifically designed for their relaxation.

The interest of many educators attending the Session will be focused on the Homewood Demonstration School, a Baltimore City summer school operated on the University campus by the city school system and staffed with city teachers. Centered in Latrobe and Maryland Halls (see picture on this page), the Demonstration School will enable Summer Session education students to observe advanced teaching techniques from nursery school through the sixth grade, as used with some two hundred pupils selected from Baltimore City.

Some 1,300 persons, judging from inquiries already received by the University, will attend the Session, in which regular classes will run from June 27 through August 5 (the courses in general biology and chemistry begin on June 19 and continue through August 12). Prospective students from forty-five states, the District of Columbia, and seven foreign countries have indicated an interest in attending.

Johns Hopkins professors will be joined by a number of visiting faculty members for the summer months, including Dr. John S. Brubacker, professor of the history and philosophy of education at Yale, Dr. Michael E. Choukas, chairman of the department of sociology at Dartmouth, Dr. Wayne A. R. Leys, vice president, dean of faculties, and professor of philosophy at Roosevelt College, and Dr. John E. Grinnell, dean of instruction at Indiana State Teachers College, Terre Haute.

Lacrosse Champions

Johns Hopkins' veteran lacrosse team started its 1950 season confidently and with great strength. As the season wore on, it became clear that its confidence was not misplaced. After defeating six opponents in a row, the Hopkins ten wound up its collegiate season on May 20 with a 10–4 victory over the University of Maryland and the national championship securely in its pocket.

Drama Conference

More than two hundred teachers from public, private, and parochial schools met at Homewood recently for the first Hopkins conference on drama in the schools. Presented jointly by McCoy College and the department of Writing, Speech, and Drama, the conference was intended to outline the requirements for teachers of amateur dramatics and to suggest better ways of developing the interest and talents of students.

Hospital Awards

Thirty-one employees of the Hospital, representing a total of more than 550 years of continuous service, were awarded service pins at the annual reception for employees last month.

Miss Josephine Waldhauser, night clerk at Hampton House nurses' home, received a pin for fifty years of service, and Edward Walker, technician in surgical pathology, was presented with a pin marking forty years of service. Thirty-year pins were awarded to five employees; twenty-year pins went to eight employees; and ten-year service pins were presented to sixteen employees.

Recent Lectures

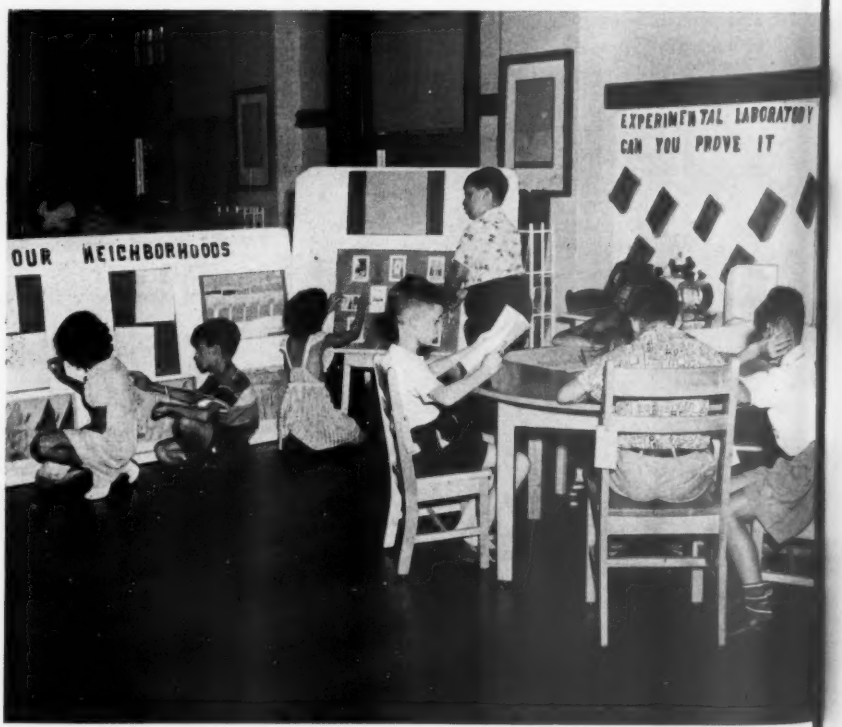
Dr. Wilder G. Penfield, professor of neurology and neurosurgery at McGill University and director of the Montreal Neurological Institute, gave the annual William Sydney Thayer and Susan Read Thayer Lectures this year. In two sessions he discussed "The Anatomy of Memory" and "The Cerebral Cortex of Man and Supra-Cortical Integration." Following the lectures Dr. Penfield met first-year students of the School of Medicine, including his son Amos Jefferson Penfield, at an informal reception at the home of President Bronk.

Dr. Edward C. Kendall, of the Mayo Clinic, delivered the Remsen Memorial Lecture at the University. Speaking under the sponsorship of the Maryland section of the American Chemical Society, Dr. Kendall discussed "Studies Related to the Adrenal Cortex."

The Charles E. Dohme Memorial Lectureship brought Dr. Frank G. Young, Sir William Dunn Professor of Biochemistry at Cambridge University, to the Hospital to give two lectures on "Experimental Diabetes Mellitus."

Henri Peyre, professor of French Literature at Yale University, delivered the Turnbull Memorial Lectures at the University on the subject of Charles Baudelaire, the French poet.

Dr. Joseph Needham, Sir William Dunn Reader in Biochemistry at Cambridge University, spoke on Chinese science at the recent Hideyo Noguchi



JHU Illustrations

DEMONSTRATION SCHOOL will be part of the Summer Session at Johns Hopkins. Above, a scene in the school's third-grade classroom (see story beginning on Page 23).

Lectures at the Institute of the History of Medicine.

Alumni Meetings

Wilmington and Delmarva Peninsula alumni, their originally scheduled dinner postponed from May 6, will meet on Saturday, June 17 at DuPont Country Club to hear President Bronk speak. Reservations ($3 per person) may be made through Judson G. Dimling, 105 Harmony Street, New Castle, Del. Assembly is at 6 p.m., dinner at 7 (E.D.S.T.).

New England alumni, meeting recently at the Harvard Faculty Club, elected Prof. Taylor Starck president and Dr. Bruce Billings secretary-treasurer. Dr. Dean Clark, director of Massachusetts General Hospital, addressed the meeting.

The Johns Hopkins Club of New York was scheduled to hold a dinner and bowling party on May 17.

Homecoming Day, with tours of the campus, luncheon, the Hopkins-Maryland lacrosse game, fraternity open houses, and a number of class reunions, was scheduled to be held on May 20.

The Johns Hopkins Engineers, at their annual dinner recently, elected Bartow Van Ness, Jr., president; Lorne Guild first vice president; Louis V. Koerber secretary-treasurer; and Col. L. G. Smith and Bill Gerstmyer to three-year terms on the executive committee.

Because of presently available facilities, most functions of the Washington (D.C.) Alumni Association are limited to the few hundred dues-paying members, it was announced recently by the group's officers. The annual dues of $1 per year are now due for 1950, the officers said, urging all alumni in the Washington area to forward their payments to Dr. Alfred G. Ennis, 1706 Summit Place, Washington 9, D. C.

Books

WILLIAM BLOOM, B.A. '19, M.D. '23: *Histopathology of Irradiation from External and Internal Sources.*

GEORGE BOAS, professor of philosophy, translator: *The Hieroglyphics of Horapollo.*

HANS GATZKE, assistant professor of history: *Germany's Drive to the West.*

EDGAR KEMLER, B.A. '36: *The Irreverent Mr. Mencken.*

THOMAS A. KIRBY, Ph.D. '33, and HENRY B. WOOLF, Ph.D. '36, editors: *Philologica: The Malone Anniversary Studies* [Studies in honor of Kemp Malone, Caroline Donovan professor of English Literature].

WERNER NEUSE, editor: *Xenion: Essays in the History of German Literature* [Collected Writings of Ernst Feise, professor of German].

JAMES HENRY OLIVER, professor of Greek: *The Athenian Expounders of the Sacred and Ancestral Law.*

ELIZABETH H. THOMSON: *Harvey Cushing: Surgeon, Author, Artist* [fac. '97–'12].

Welch Library

The William H. Welch Medical Library was extensively renovated for the observance of the centenary of the birth of Dr. Welch. New decorations provide striking background for the large exhibit on the life and works of Dr. Welch. The exhibit will be continued through June.

The Faculty

● *President Detlev W. Bronk* delivered the address at the dedication of the new building of the New York Academy of Sciences on April 11 and at the opening of the Fondren Science Hall of the Southern Methodist University in Dallas, Texas, on May 10. On May 3, he spoke at the annual banquet of the American Psychiatric Association in Detroit, which marked the assumption of the presidency of the association by Dr. John C. Whitehorn, Henry Phipps professor of psychiatry; at the opening session of the fiftieth anniversary meeting of the American Society of Bacteriologists, of which Dr. Barnett Cohen, associate professor of physiological chemistry, was president; and at the annual meeting of the American Orthopedic Association, of which Dr. Robert W. Johnson, Jr., adjunct professor of orthopedic surgery, is president.

On June 17, President Bronk will speak at the dinner of the Wilmington (Del.) Johns Hopkins Alumni Club, thus completing his schedule of eleven alumni gatherings during recent months in Boston, New York, Atlantic City, Washington, Atlanta, Dallas, Houston, Cincinnati, Chicago, Los Angeles, and San Francisco.

The late President Emeritus Isaiah Bowman has been honored by the establishment of a $100,000 permanent trust fund in his name at the American Geographical Society. Established by Archer M. Huntington, the Isaiah Bowman Memorial Fund will be used by the society for lectures and research fellowships.

● *In the Faculty of Philosophy,* Christopher Gray has been promoted to assistant professor of art. Charles Niver will be lecturer in art during the first term of the academic year 1950–1951, and Dorothy Miner will be lecturer during the second term.

Clifford P. Froehlich will be visiting associate professor of education next year, and Gertrude M. Lewis will be visiting lecturer in the department.

Charles R. Anderson, professor of American Literature, will become chairman of the department of English next month. Graham Hough has been appointed visiting lecturer on Victorian literature for the year 1950–1951.

James A. Jenkins will be assistant professor of mathematics during the next year.

J. Harvey Wheeler has been appointed assistant professor of political science for the year 1950–1951.

Randall M. Hanes has been promoted to assistant professor of psychology.

Pedro Salinas, professor of Spanish literature, has been appointed a permanent member of the Hispanic Society of America.

● *At the School of Medicine,* Dr. John C. Whitehorn, Henry Phipps professor of psychiatry and director of the department of psychiatry at the Hospital's Phipps Psychiatric Clinic, has become president of the American Psychiatric Association.

Dr. Curt P. Richter, associate professor of psychobiology, has been awarded the Warren medal for distinguished research in psychology by the Society of Experimental Psychologists.

Dr. Edwards A. Park, professor emeritus of pediatrics, has been awarded the George M. Kober medal, one of the top awards in internal medicine.

Dr. Luther L. Terry, assistant in medicine, has been named head of a newly created clinical division of the National Heart Institute research program.

Dr. Louis M. Hellman, associate professor of obstetrics, has been appointed the first full-time professor of obstetrics and gynecology at the State University Medical Center at New York City, College of Medicine.

Dr. George B. Koelle, Chalfant Fellow in ophthalmology at the Wilmer Institute, was awarded the Abel Prize at the dinner of the American Society for Physiological and Experimental Therapeutics.

Dr. Jonas S. Friedenwald, associate

professor of ophthalmology, has been awarded the Proctor medal for distinguished research in ophthalmology.

Dr. Richard J. Bing, associate professor of surgery, will be the Alpha Omega Alpha speaker this month at the University of California Medical School, San Francisco.

Dr. Helen B. Taussig, associate professor of pediatrics, has been elected a member of the American Association of Physicians.

● *At the School of Hygiene and Public Health*, Dr. Ernest L. Stebbins, director of the School and professor of public health administration, has been elected president of the National Health Council.

Dr. Dean W. Roberts, lecturer in public health administration, has been appointed to the newly-created position of deputy director of the State of Maryland Department of Health.

Dr. Robert A. Nelson, Jr., research associate in bacteriology, received the national award of the American Venereal Disease Association for discovering a way of diagnosing syphilis said to be more exact than the Wasserman test.

Dr. Huntington Williams, Baltimore Commissioner of Health, has been appointed adjunct professor of public health administration.

Dr. Joseph L. Lilienthal, Jr., has been appointed professor of environmental medicine, a new department which will combine for the first time research comparing individual illness and community disease. Dr. Lilienthal was recently made a member of the American Association of Physicians.

● *At the Welch Medical Library*, Dr. Sanford V. Larkey, director and librarian, has been elected chairman of the Council of National Library Associations.

The Alumni

Edwin G. Conklin, Ph.D. '91, LL.D. '40, has been reelected president of the American Philosophical Society.

An annual chemistry lecture series at West Virginia University has been named for Friend E. Clark, Ph.D. '02. The Tau chapter of Phi Lambda Epsilon, national honorary chemistry society, inaugurated the series in honor of Dr. Clark, who had been head of the West Virginia chemistry department for twenty-eight years.

Robert E. Coker, Ph.D. '06, was presented with the second annual O. Max Gardner award. The honor is given to the member of the University of North Carolina faculty "who, during the current scholastic year, has made the greatest contribution to the welfare of the human race."

Jack Engeman

CENTENARY of the birth of William H. Welch was marked by exercises at the University and Hospital recently. Above, President Detlev W. Bronk (left) and Abraham Flexner at the evening meeting at the Sheraton Belvedere Hotel. In the afternoon Dr. Bronk presided at a panel discussion which included Dr. Allen W. Freeman, professor emeritus of public health administration, Hopkins School of Hygiene and Public Health; Dr. Ernest W. Goodpasture, professor of pathology, Vanderbilt University School of Medicine; Dr. Alan Gregg, director of medical sciences, Rockefeller Foundation; and Dr. Richard Shryock, director of the Institute of the History of Medicine, Hopkins School of Medicine.

Maurice C. Pincoffs, M.D. '12, fac. '20–'21, has been named president-elect of the American College of Physicians and Surgeons. He will assume the presidency next year.

Dr. Pincoffs is also head of a new sixty-four member committee appointed by the governor to coordinate all phases of Maryland's public health program.

Joseph M. McDaniel, Jr., B.A. '24, Ph.D. '30, has returned to Northwestern University to become dean of the School of Commerce.

Donald S. Martin, B.A. '25, has been made dean and professor of microbiology at the University of Puerto Rico School of Medicine.

Roger Shaw, B.A. '25, won the annual Toulmin medal of the Society of American Military Engineers for his new book, *Adam to Atom*.

Lionel C. Durel, Ph.D. '28, who will retire next month as head of the department of French of H. Sophie Newcomb Memorial College, New Orleans, was recently cited for the "fostering and maintenance of French teaching and culture."

William S. Woods, g. '34–'35, will replace Dr. Durel as head of the Newcomb French department.

Deaths

(*Dates are 1950, except where otherwise noted.*)

James Kerr Anderson, M.D. '17, March 27.

Frank Andrews, B.A. '93, g. '96, March 2.

Harry L. Arnold, g. '92–'97, April 12.

J. Howard Beard, M.D. '12, April 5.

Jacques J. Belemer, fac. '24–'41, September 19, 1949.

Joseph Hemsley Bernard, '26, '28–'32, July 4, 1946.

Emanuel E. Bransky, '18, May 1.

Robert Hawthorne Canfield, Ph.D. '25, fac. '28, August 17, 1948.

Sidney Chayt, B.S. '36, April 29.

J. Frank Crouch, g. '90–'94, April 20.

Clarence Dykstra, LL.D. '41, May 6.

Don W. Dykstra, M.P.H. '39, December 31, 1949.

Harry Friedenwald, B.A. '84, g. '86–'87, April 8.

James Richard Frow, M.D. '08, September 19, 1949.

John M. Glenn, g. '79–'80, M.A. '02 (hon.), trustee '05–'42, April 20.

Joseph Henry Howard, g. '94–'96, August 26, 1949.

Thomas Jackson Huggins, Jr., '36–'37, March 30, 1949.

George Dudley Iverson, Jr., '24–'25, October 11, 1948.

Arthur Cohen Kalisch, B.A. '28, M.D. '32, October 5, 1949.

Harold Levi Lawrence, M.P.H. '41, March 11.

Augustus G. Pohlman, fac. '03–'04, March 31.

J. Harry Schad, B.S. '17, M.A. '21, D.Ed. '31, g. '31–'32, October 11, 1948.

Henry Danford Steele, g. '92–'93, March 3, 1948.

Howard Lester Taylor, M.D. '10, April 11.

Louise Emilie Thalwitzer, '11–'12, '16–'17, g. '20, July 20, 1949.

Joseph Vincent Tracy, g. '91–'95, '97–'98, February 12, 1947.

J. Konrad Uhlig, B.A. '06, g. '06–'08, April 16.

Charles Adolf Witz, '14–'16, March 18.

Stanley Worden, B.A. '22, M.D. '26, April 11.

THE EPICUREAN BLOWFLY

Continued from Page 22

known as an olfactometer for the purpose. It has two chambers: one, a mixing compartment in which the gases are prepared, the other a "reaction chamber" in which the test flies are put. Both sections are fully insulated and kept at constant temperature.

Between the two chambers is a pair of portholes, one the "control port" through which filtered air is passed from the mixing compartment to the reaction chamber, the other the "experimental port" through which either filtered air or a test gas can be passed.

Flies are put in the reaction chamber in a wire screen cage, one side of which is set adjacent to the two ports. Under the cage floor are two exhaust ports through which the gases are pulled out of the compartment.

Behind the ports on the mixing-chamber side are three seventy-five-watt lamps. Their light attracts the flies to the two ports, where they distribute themselves in just about equal numbers. Then comes the "smell test."

Vapors are passed through the experimental port until a significant number of flies are driven away from it. Their actions are recorded on a camera aimed through a window in the far wall of the reaction chamber.

"Each experiment," explains Dr. Dethier, "consists of a control test and an experimental test. One hundred flies are placed in the cage. The lights are flashed on for thirty seconds. One camera exposure is then made. A minute of darkness follows. The procedure is then repeated. In this way ten exposures are made with both ports delivering air—the control.

"The same sample of flies is run in identical manner with a test vapor of known concentration emerging from one port. For the next concentration of the test material a new sample of flies is used.

"The success and accuracy of this instrument," Dr. Dethier continues, "depends on control of inaccuracies attendant upon the production and measurement of vapors of different concentrations and variables reflected in the behavior of the flies."

The first problem can be handled by making sure that the recording instruments in the olfactometer are accurate, but the flies' behavior has presented some puzzling difficulties. Some samples of flies, for instance, have failed to respond to light, an inconvenient idiosyncrasy on the insects' part which held up the investigations for a substantial period of time while the scientists tried to find why the eccentric flies acted as they did.

THE FINAL OUTCOME of Dr. Dethier's work is impossible to foretell at this point; he is certain that the project will continue for a long time to come, for as fast as new things are learned about the fly, new questions present themselves. Basically, the work is a painstaking process of adding to man's fundamental knowledge about one facet of life; stemming from it, as is frequently the case with such research, are practical applications of the knowledge which have a direct and immediate utility value. Everyone, eventually, may profit from it.

AGAINST FEDERAL SCHOLARSHIPS

Continued from Page 2

ter on the community's five-charge circuit, hearing of the ambitious lad and omnivorous reader, avid for more education, called on the farmer parishioner to volunteer his service as a tutor. Acceptance was promptly given. In return for a load of corn for the itinerant's horse, a load of hay, of straw and one or two loads of firewood, all of which was hauled from his father's farm by the pupil, the busy pastor gave about an hour a day to hearing the youth recite his lessons. The pupil spent some six hours a day for five days a week in the pastor's study. He was able to master without much assistance the nine units required for admission to the Johns Hopkins University in the fields of English, history, physical geography, and mathematics—algebra, plane and solid geometry. But the four years of Latin and two of Greek needed the help of the patient pastor.

Two years of this exchange of farm products for a pastoral by-product of instruction prepared the candidate to pass the entrance examinations with "minor" conditions in Greek and Latin Prose Composition, which would have taken four years in an accredited high school.

With a loan of $150 from a neighboring farmer and the same amount of cash from home, the writer by tutoring and other projects was able to graduate with his class in four years. Through tutoring and part-time teaching in Baltimore high schools he went on to obtain the doctorate of philosophy in Romance languages at the Hopkins. When the head of the department tactfully told him he needed facility in speaking French, he obtained a free trip to Paris via one of the "cattle-ship" liners then plying weekly from the port of Baltimore to Liverpool. Via a species of evolution through the positions of college professor, registrar, dean, and president, he has attained his present position as counselor and servant to 670 college and university presidents.

During the seventeen years of his presidency of Birmingham-Southern College, an accredited college with a Phi Beta Kappa chapter, the writer has had the thrilling experience of helping many young men and quite a few young women to college graduation who raised their tuition and other college expenses largely or completely through their own efforts. In most cases these ambitious youths graduated with distinction. Nearly all of them now hold high positions in their chosen fields of life work.

By way of illustration and emphasis an example or two from various fields of human endeavor can be cited. The present Congressman from Birmingham, ninth District of Alabama, was a campus worker and found time to be president of the student body. Another student body president came from a South Alabama farm with his only capital of $100 borrowed from an erstwhile neighbor; he is now president of an

accredited college and highly respected in educational circles, as indicated by various prominent committee assignments of a national character which he holds.

Quite a few clergymen now holding appointments in the larger churches paid their way through Birmingham-Southern College by outside activities, including part-time preaching. One of this number is dean of a well-known school of theology. Several earned their way as reporters for the Birmingham newspapers. One of these is now editor of a church paper of national connections; another continued advanced study through outside work and post-graduate scholarships to a doctorate at Yale University in Arabic and was for a time U. S. Cultural Attaché in Cairo, Egypt.

One lad earned his way as clerk in the bursar's office and now has a high position with the DuPont Company, while another from the same office is a business success in San Francisco. Of those who entered the law there comes to mind one who was the president's secretary who is now assistant to the chancellor of a large state university system and who recently declined a college presidency in Georgia.

A young woman became the dean's secretary after a year or two in the business world following her high school graduation. Shortly after graduation from college she became secretary to the head of an important New York foundation. She is now the wife of a distinguished physician in Seattle and is a leader in community life as well as the mother of three brilliant youngsters. Another young lady earned her tuition as college reporter and assistant to the alumni secretary: she is now wife of a high government official in Washington and has been the editor of a well-known magazine.

MANY other illustrations could be listed from the Birmingham-Southern alumni. The same inspiring record holds in other colleges. Harvard, our oldest college, has just established in Cambridge a student aid center with several persons on full time to direct its program.

For the more brilliant students there are many scholarship opportunities which pay part or all of the tuition fees, and sometimes, in addition, part or all of the living expenses. This statement can be verified by a cursory study of college catalogues. In most cases the award is made on a competitive basis.

For those high school graduates earnestly seeking a college education who are unable to find jobs or win scholarships, there are available loan funds. Each college has its own load funds, though in most cases somewhat limited. There are many other loan funds open to all: some have certain restrictions. For example, the Methodist and Presbyterian Boards of Education have accumulated large funds available to their respective constituencies. The Masons and other fraternal organizations have sizable loan funds. There are also independent foundations like the Pickett and Hatcher Education Fund of Columbus, Georgia, which have millions of dollars on hand for lending to students in liberal arts colleges.

THE ABOVE data will refute largely the criticism that college nowadays is geared up to take care only of the sons and daughters of the rich. "Where there is a will there is a way" still holds true.

Suppose we succumb to the narcotic suggestion that it is best for the taxpayers to send additional monies to Washington to be assembled and distributed back to the states (after a large share for overhead has been retained) for a general scholarship program of large dimensions; what will happen to the great horde of additional college graduates? Quite obviously most of these will clamor for Uncle Sam to guarantee them posts of responsibility with commensurate stipend. If they lack initiative in the first place, it is unlikely they will gain it in college. A good article on this subject was written by Professor Seymour E. Harris of Harvard for the January 2, 1949 issue of the New York *Times* Magazine. The title is "Millions of B.A.'s, But No Jobs."

It is readily conceded that our nation desires and really needs to have its citizens obtain all the education they can absorb. It is fair to say also that we have a higher percentage of more highly educated people than most other nations, as well as a lower illiteracy rating. These facts became quite evident from observations the writer made last summer in a trip around the world with the Town Hall party.

In addition to the opportunities previously described, the fast growing junior college movement opens doors to high school graduates of limited means. This type of college in most instances is state-supported, hence with little or no tuition fee.

ASSUMING for the moment that there is no longer a limit to the taxpayer's ability to "cough up," we must face squarely the dangers ahead when we abrogate the state's responsibility to the Federal government. One is like the ostrich who buries his head in the sand when danger threatens if he believes Federal aid does not entail Federal control. No grants can be made without a certain amount of auditing and supervision. Bureaucracy, more or less arrogant, always has risen in other areas of government assistance. In foreign lands where there are schemes of Federal scholarships the heavy hand of the bureaucrat is ever felt.

Some will say here, "What about the G.I. scholarships?" Of course, we all applaud this noble gesture of a grateful country to the lads who offered their all to save our democratic form of life. The plan was developed to give the boys a chance to recover the educational opportunities they lost in the war years. This type of Federal scholarship is for a specific purpose and for a short period. Alas! even in the management of this most worthy project the ugly shadow of arrogant bureaucracy looms on the horizon. For interminable hours the writer has sat with the Committee on Relationships of Higher Education to the Federal Government of the American Council on Education listening to and participating in arguments with Veterans Administration officers over policy matters which should be left to college administrators.

UNTHINKING persons will feel that when the term of veterans' aid expires, which will occur shortly, the colleges will suffer greatly. The higher institutions have bravely met the unexpected overwhelming increase in enrolment brought about by the passage of the Serviceman's Readjustment Act. However most colleges and universities, both large and small, indicate that they will be glad to return to a normal enrolment in keeping with their physical and financial capacity. The majority have already announced maximum figures of enrolment they desire to maintain.

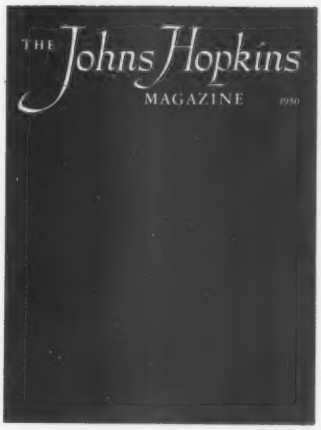
An unexpected result of the recent

rapid recession in G.I. enrolments is the effect being felt by the women's colleges. The departure of the veterans releases dormitory space and other facilities in the state universities and other co-educational colleges and universities so that women candidates are no longer discouraged by admissions' officers of the "co-ed" group of institutions. Quite a few women's college presidents are reporting to their surprise that they have this spring no waiting lists of aspirants for admission as prevailed for the years since 1945.

The Congress continues blithely to subsidize the raising of potatoes though carload after carload may have to be sold for one cent per one hundred bushels as was done recently by our Government in a shipment to Portugal, according to a United Press report.

This policy is far more humanitarian than pouring kerosene on piles of potatoes in Maine to make them unusable. It may be possible that our solons will feel it necessary to keep the colleges full by appropriating funds for Federal scholarships. They surely will face more serious difficulties in disposing of the unemployed alumni than they do with the surplus potatoes. At least there would be a clamor to substitute perfume for kerosene.

The unrealistic social planners can discover that the colleges are meeting the emergency, as they have done in previous crises. Following the lead of the older and stronger institutions, practically all colleges are making dignified appeals to alumni and other friends for annual gifts for current operations. Thus most of them are able to balance their budgets. A group of four colleges in Indiana banded together last fall for a joint appeal to the larger corporations for gifts for current operations. The results were so gratifying that the rest of the independent and church-related colleges in Indiana met on April 11 of this year to do more intensive cooperative work in this direction. A group of twenty-odd non-state-supported colleges of Ohio have recently organized for the same purpose. The Association of American Colleges has a standing commission to cooperate in this area under the chairmanship of President Harold E. Stassen of the University of Pennsylvania.



The Next Issue

The Johns Hopkins Magazine is not published during the months of July, August, and September. The next issue will appear in October.

The published records of the independent colleges and universities indicate eloquently that alumni and others have responded well to appeals for annual gifts. The church-supported colleges should, and many do, make their cases stronger with their constituencies. I know of one church college that receives $65,000 annually from its supporting synod. I have read official reports that others have received around thirty and forty thousand dollars annually from their respective supporting conferences. The independent and church-related colleges must not, and will not, fall behind in the procession.

Persons worrying about the possible demise of the colleges might take heart from the perusal of a front page article in the New York *Times* for March 20, 1950. This article observes that the Education Directory of Higher Education issued by the U. S. Office of Education reports in its current issue the addition of 89 new institutions. A superficial glance at the story would give the impression of a great expansion in the number of regular colleges. However an intimate study of the additions shows but 13 new four-year colleges: all the rest are junior colleges or technical and professional institutes. The Directory indicated the closing of one unaccredited four-year college. This leaves a gain of twelve with optimistic administrations.

The same old pioneer spirit that made our country great will keep our college and universities operating on a high plane and will assure our young people of ambition an opportunity for a college education.

FOR FEDERAL SCHOLARSHIPS

Continued from Page 3

the G.I. Bill of Rights. Among its provisions was a system under which the Federal government would pay most, if not all, of the costs of tuition and books, plus a monthly subsistence allowance, to veterans whose education had been interrupted by the war and who desired to go back to school. The interpretation of what constituted an "interruption to education" was liberal, so that millions of World War II veterans were covered by the G.I. Bill's education benefits.

Many educators watched the early Congressional discussions of the G.I. Bill with some misgivings. Not that many of them disagreed with its fundamental objectives nor that they failed to have grave views about the fact that many young people in this country were being deprived of a higher education solely on financial grounds; they did not. But there was some fear that government aid might mean government control of educational institutions, or that it might rob prospective students of any incentive to help themselves. So, while applauding the basic aims of the proposed bill, the educators cautioned against the government's going too far.

"No governmental agency," wrote Chancellor Robert M. Hutchins of the University of Chicago in 1943, "has yet been authorized to say what kind of education civilians should have. I should hope that no governmental agency in our time would be authorized to determine this point."

As it turned out, the bill admirably avoided such pitfalls. In effect, as a result of the G. I. Bill, the Federal government gave the money but kept hands off the educational machinery.

The colleges administered their own admission requirements; the veterans decided where they wanted to go; the schools maintained their own academic standards.

And lots of young men and women who otherwise could never have obtained a higher education attended the colleges and universities of America in the postwar years.

TODAY, the number of such students is passing its peak at most schools. Within a few years, the relative equality of educational opportunity, at least as afforded to veterans by the G.I. Bill, will be but a memory; and if nothing is done about it, higher education will be on the same basis as before the war. If a family can't pay the high bill, its children can't go to school—unless, of course, they are in the fortunate minority which is accommodated by the limited number of private scholarships which are available.

The questions which arise from that circumstance are of concern to the whole country: Do we really *want* to go back to the old way? Or should the Federal Government continue the trend established by the G. I. Bill and set up a system of scholarships instead? Many people who, before the G.I. Bill experience converted them, vigorously opposed any suggestion that the Federal Government subsidize the education of students in private universities, are now saying that they do *not* want to go back. A number of them, indeed, are hinting that the nation may be cutting its throat if we do.

This last assertion revolves around the belief, from which few people will dissent, that the country's future depends in large measure on the economy with which we utilize the intellectual resources of the coming generations. Today as never before, it is maintained, we must develop the country's potential leaders to the utmost; tomorrow we shall need them desperately, and we should not leave the supply of them to chance.

The sciences, for example, will need the most outstanding young men and women they can get their hands on if this country is to maintain the scientific leadership which seems imperative in times like these. Equally, we shall need the best-educated persons possible in business and in government—men of vision and capability who can continue the upward slope of the country's standard of living and of responsible participation in world affairs.

If the possessor of a brilliant mind, then, is budding in high school, it is important to the country that he go on to college, and through graduate school as well, if he has the capacity and the will for it. Whether or not his dad can foot the bill, many persons argue, should not enter the considerations. As it is now, however, without aid from the government, or unless he can obtain a private scholarship (and the chances of this are severely limited), he may end up as a clerk or laborer—which, while a useful and honorable occupation, certainly, will utilize but a fraction of the man's intellectual resources for the country's benefit.

And who is to say, the argument runs, that the best potential leaders—the men and women on whom we would most economically be spending our higher-education effort—come only from that group which is rich enough to pay the necessarily high fare at American universities? All the evidence shows that that is simply not so; but because there is usually no other way out, that is the group from which the private universities, in non-G.I.-Bill times, must draw the bulk of their students. Along with the unusually bright boys and girls, as a result, come a number of students whose intellectual status is somewhat less than outstanding. And many outstanding students, whose only lack is cash, are excluded.

All of which, from the country's standpoint, dilutes the effectiveness of our leadership of tomorrow. The nation's outlook is the darker for it.

SO MUCH for the national-welfare aspects of Federal scholarships. Even more important, perhaps, are the personal, individual implications of the proposals to adopt a Federal scholarship plan.

There is no doubt that for years the high cost of higher education has deprived thousands of promising young people of that equality of opportunity in life to which this country aspires. The world today is ever more demanding about the educational prerequisites for high (and even middle-level or low) jobs in business, industry, research, and government (here we are speaking not simply of the often-unjustifiable technical requirement that a man be a "college graduate" before he can fill a routine job, but more of the genuine needs of many positions for men with college and graduate educations). The effect of an inequality of opportunity for education therefore may be felt all through one's life. Bright young people whose parents can afford a college education for them may have one sort of opportunity; those whose parents cannot afford it, another.

That one generation of a family may be penalized all through life, through no fault of its own but by the economic status of a preceding generation, hardly conforms to the American dream. Supporters of a system of Federal scholarships believe their proposals may eventually provide an effective solution to the problem.

WHY, if we *must* have government scholarships, should it be Federal aid, rather than support by the states? Has not the experience of many states with their state universities indicated that here, rather than through the national government, lies the best answer to the equal-opportunity problem?

There are several strong arguments in support of a negative answer to this question. First there is the plain fact that while many states have been able to do wonderfully fine jobs with their state universities, there are others which are so poor, financially, that the establishment and maintenance of a first-rate state university is simply impossible for them. As a result, the young people in the poor areas get few of the lower-fee benefits which their contemporaries in the wealthier states receive; the geography of their birth has made their opportunities unequal to those of their neighbors across the state line. This is a disadvantage which a federal-scholarship system could overcome.

Second, the bulk of state aid goes to state-operated institutions only; it does not help to a great extent the students who would attend privately-run colleges and universities. One can find exceptions to this: the State of Maryland, for example, appropriates money to the Johns Hopkins University's School of Engineering, in return for which a number of state scholarships are provided; but this is not a general practice. Since often there are important reasons for attending a private rather than a public college or university, it is desirable that students there, too, be aided by the government where necessary. Again, the Federal scholarship scheme provides a solution.

Of course, not *any* system of scholarships will do; it must be carefully

worked out and carefully hedged against abuses, this Federal scholarship system of which we speak. It must be protected against the danger of political control of free thought; where enormous sums of money are appropriated by government, there seem inevitably to spring up sinister schemes for perverting its use. Nor could freedom of education long survive, perhaps, if governmental agencies, under one pretext or another, were constantly harrassing it with probes of its curricula, supervising its scholastic standards, meddling in its choices of students and instructors (all of which, some people in government might maintain, the Federal appropriation of funds gives the government a perfect right to do). Safeguards against this sort of thing most certainly belong in any law that is passed; and they most certainly are possible.

Nor should the Federal scholarship proposals be regarded by the public as making higher education something to which all young men and women, regardless of their capacities for it, would be "entitled." The standards of eligibility should be carefully worked out; the G.I. Bill experience, which left the matter of entrance requirements and academic standards up to the institutions themselves, suggests how this may effectively be done.

Properly carried out, however, the creation of a system of Federal scholarships would benefit the nation enormously—far out of proportion to the costs it would entail. It would bring many of our democratic objectives closer to fulfillment. It would strengthen our future security by putting the preparation of tomorrow's leaders on a sounder basis than ever before. It would be one of the key steps in the climb to a higher level of American civilization.

THE CLASS OF 1950

Continued from Page 18

members of the Class of 1950 with a job assured and no family responsibilities tend to take a more philosophical attitude about their ultimate goals. "Security? Naturally we want security," they say. "But that's at the bottom of the list. There are other things more important—a chance to be creative, for one."

Outsiders have taken note of these attitudes and appear to be concerned about them. The graduates of '48, '49, and '50, the editors of *Life* have remarked, are turning their backs on "one of the most cherished prerogatives of youth": they are taking no chances. *Life* added that if this desire for security is a "deep-down" conviction, then there is a genuine cause for concern.

Is our yearning for security an indication that creativeness among the Class of 1950 and its immediate predecessors is on the downward grade? The group that is concerned about this "overemphasis on security and the lack of creativeness" may be talking through its hats. Many contend that an individual can seek security without becoming a slave to it; they see no basic conflict between security and creativeness.

The Class of 1950, along with the others which have graduated in the past four years, will ultimately provide the answers to the questions we can only speculate about as we try on our caps and gowns. Our elders are not the only ones who want us to find the *right* answers; *we* hope we find them, too.

LETTERS *ABOUT THE MAGAZINE*

The First Issue

The first copy of *The Johns Hopkins* Magazine came today. . . . I like it very much. The Magazine has a beautiful format, and the choice of type very satisfying. The cuts are excellent, and the matter diversified enough so that the issue ought to appeal very widely. If I were to make a remark, however, it would be that in future issues I'd like to learn more of what the departments of humanities, mathematics, and social sciences are doing. . .

S. W. Geiser

Dallas, Texas

. . . It was a startling albeit welcome experience to receive a communication from the University which did not demand a cheque drawn to a goodly amount . . . Volume I, Number 1 toes the mark. I found the articles interesting and agreeably written, although in several cases where notable Hopkins figures were eulogized they emerged only slightly less omniscient than the Oracle of Delphi. . . .

Charles M. Myers

Newark, N. J.

. . . A publication of this character should do much to cement relations between the University and its many alumni and friends.

College Park, Md. Karl P. Wirth

. . . I like it . . .

John McGraw

Easton, Pa.

. . . Extremely interesting, informative, and attractive. . . .

Chicago, Ill. M. L. Perman

. . . An excellent and commendable publication. This fills a long-felt need and is thoroughly appreciated by one and all of us. If it is not considered inappropriate, may a few lines be added concerning our Fourth Alumni Roll Call, which will be started in early September? A number of universities have already started their campaigns. One of these has proudly announced that total contributions are up sixty-five per cent; the number of contributors is up twenty-six per cent; and the average amount contributed is up thirty-three per cent. This is an amazing manifestation of the reservoir of strength that lies in the potentialities of loyal, generous, and thoughtful men and women. For our University, let us all pitch in and show that we can do the same.

Robert M. Torrence, '95

Baltimore, Md.

Hopkins On Television

. . . That was an interesting article by Lynn Poole on Hopkins' television venture ["The Professor Takes To TV," April]. What stations carry the program?

Baltimore, Md. L. Thom

"The Johns Hopkins Science Review" is now presented over WAAM, Balti-

LETTERS

ABOUT THE MAGAZINE

Continued from Page 31

more, and may be viewed on Fridays at 9:30 p.m. (EDST). Incidentally, effective on May 12, the "Review" became the first such educational television show to be sponsored by industry. The Davison Chemical Corporation is sponsor.

"Our acceptance of sponsorship," remarked President Bronk, "is another step in the exploration of beneficial cooperation between the academic and industrial worlds."—ED.

Hopkins Monument

. . . I am puzzled by the monument to Johns Hopkins [cover photograph, April], for I do not remember having seen it when in Baltimore a few years ago. I would suggest that in a future issue the Magazine publish an article describing the monument and telling when it was erected and by whom, and by whom it was executed.

ROBERT PAYNE BIGELOW, PH.D. '92
Brookline, Mass.

The monument was designed and executed by Hans Schuler, director of the Maryland Institute. It stands in the center of North Charles Street at Thirty-Fourth Street, just opposite the bowl in front of Homewood House at the east edge of the Homewood campus. It was dedicated on September 18, 1935, the gift of the Municipal Art Society to the City of Baltimore. President Isaiah Bowman, making his first public appearance in Baltimore at the dedication exercises, said, "We honor the name and deed of a man who least needs a monument, and most deserves to have one."—ED.

The Johns Hopkins monument.

Dr. Bowman

Thank you for printing the trustees' moving tribute to President Bowman in your April issue. I wish, also, that you would publish President Bronk's words at the University's Commemoration Day exercises on February 22. I remember them as being a most fitting memorial to a man to whom Hopkins owes so much.

HARRY L. HOLMAN
Friendsville, Md.

Dr. Bronk said: "As we commemorate the seventy-fourth anniversary of the founding of our University I would with sadness speak of the loss of one

Dr. Bronk receives the keys to Homewood House from Dr. Bowman.

who made the University great. Our dear friend and leader, Isaiah Bowman, fulfilled in fullest measure the ideals of our founders. Devoted, as he was, to the scholarly advance of knowledge, he strove to preserve the Hopkins as a community of scholars against the distractions of a materialistic age. Naturally a teacher, he sought to transmit to each new generation the satisfactions of intellectual endeavor. An ardent patriot, he answered every call for service to his nation and fired our University with his devotion to the national interest. As a great humanitarian, fortified by knowledge of all the lands and peoples of the world, his service to human welfare knew no national boundaries. The Johns Hopkins University will ever be a monument to Isaiah Bowman. His enduring spirit will challenge us and our successors to maintain the University as a center for intellectual adventure, as a home for those who would increase their understanding of man and nature to the benefit of mankind. He has added to our rich heritage of example and ideals."

Hopkins, 1940–1950

. . . Mr. Macaulay's survey ["Johns Hopkins: 1940-1950," April] was superb . . . gave me the best view of the scope of J.H.U. I have ever had.

V. J. WYCKOFF, '20
Greencastle, Ind.

Sopher's Bug

. . . I was glad Aaron Sopher [whose whimsical drawings illustrated "The Professor Takes To TV," April] left something to one's imagination and didn't call his bug a cross between a centipede and a fly—with a technical name.

L. MARSTON
Baltimore, Md.

The pH Test

. . . Didn't you have your pictures crossed in illustrating the pH analysis in the Chesapeake Bay Institute article in your April issue? The photograph you describe as showing the test for turbidity looks like the pH analysis to me, and vice versa.

CARL JOLSON
New York, N. Y.

You undoubtedly have heard from many readers about the reversal of pictures on Page 20. . . .

RALPH J. WHITELOCK
Baltimore, Md.

We have, indeed. The transposition of photographs showing the Chesapeake Bay Institute's pH analysis and the test for sediment in the water got past the editors, but not past the sharp eyes of a number of readers. Below, the picture that *should* have been above the pH-analysis caption.—ED.

This is pH analysis.

Do you know...

a bride...

or a graduate...

or a new baby...

or a birthday girl?

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